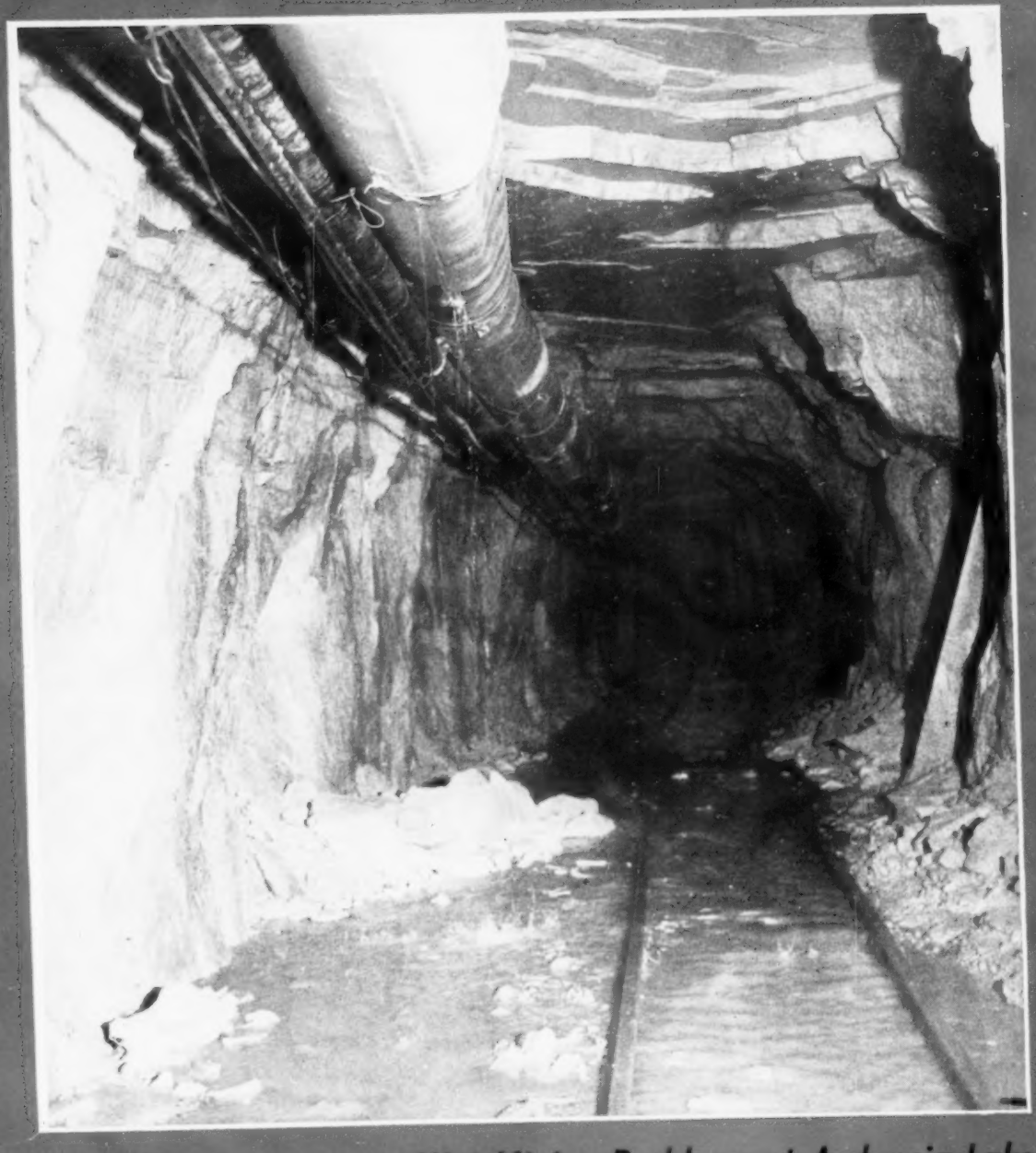
AUGUST 1958 VOL. 20 NO. 9

MINING WORLD

How Brazil's New Manganese Mine Was Developed Page 34

Chino Mines Saves Money With Roadbinder Page 38



Wet Mining Problems at Ambrosia Lake

Page 30

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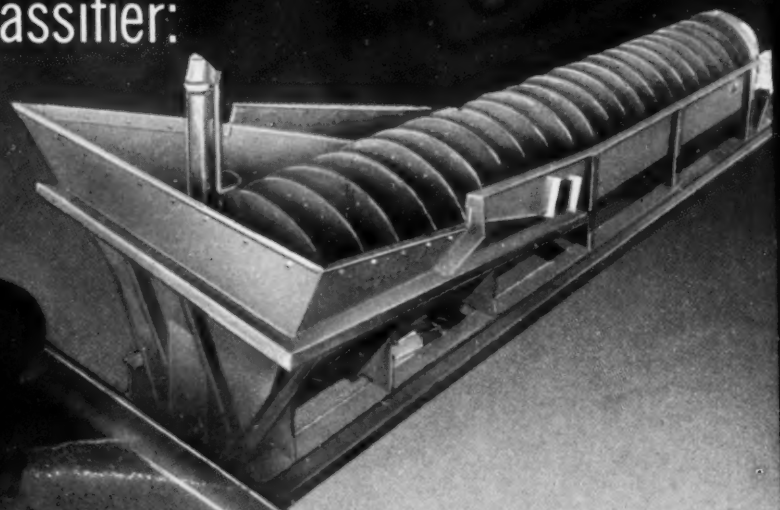

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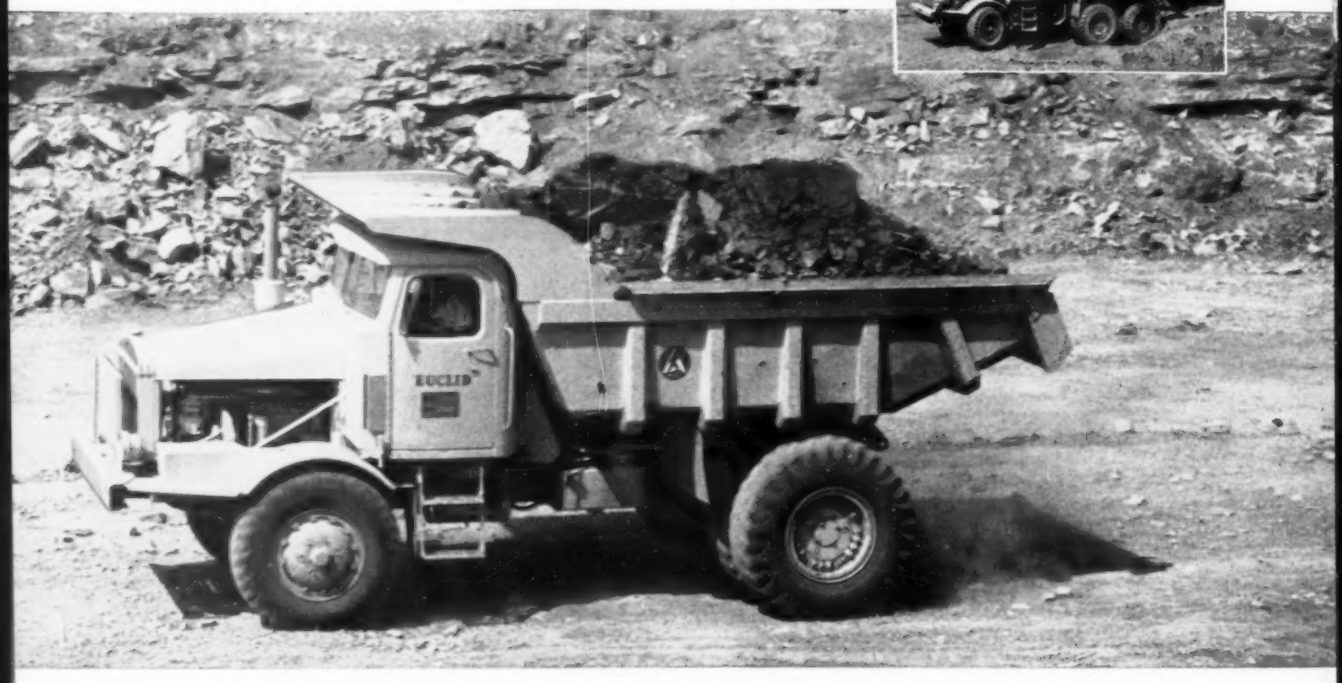

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Mining World

Including the Export Edition **WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 20 **AUGUST 1958** No. 9

OPERATIONS—TECHNOLOGY

Underground Mining

Water Makes Problems at Deep Ambrosia Lake Mines 30

By George O. Argall, Jr.

Water plus blasted ore makes slop in the deep uranium mines. This creates a materials handling problem. Work is underway to determine best mining method. Water inflow has been less than expected.

Open Pit Mining

New Brazilian Manganese Mine Reaches 600,000 Ton Output .. 34

ICOMI now operates one of the world's largest manganese mines 280 miles north of Amazon River. An open pit mine, washing plant, railroad, and ship loading docks have been carved out of jungle.

How Chino Mines Saves Money With Roadbinder 38

Lignin sulfonate sprinkled on Chino's open pit haul roads reduces dust, makes smooth strong road surface, cuts number of sprinkling shifts, saves water, and makes maintenance easier.

Flotation

How Eagle Mill Recovers More Metal From Complex Ore 42

By F. J. Witthauer

New Jersey Zinc Company's differential flotation mill at Gilman, Colorado changes flowsheet and reagents to increase slimed-lead recovery and improve copper recovery in the lead concentrate. Grinding is in an alkaline circuit.

Gravity Concentration

Selective Crushing Proves Key To Gravity Concentation 46

By P. Seyer

The important French tungsten and tin mines use gravity concentration for recovery and separation of minerals. Tests made on ore put through a Hazemag impact crusher prove that sliming is reduced and that clean concentrates can be recovered by conventional methods.

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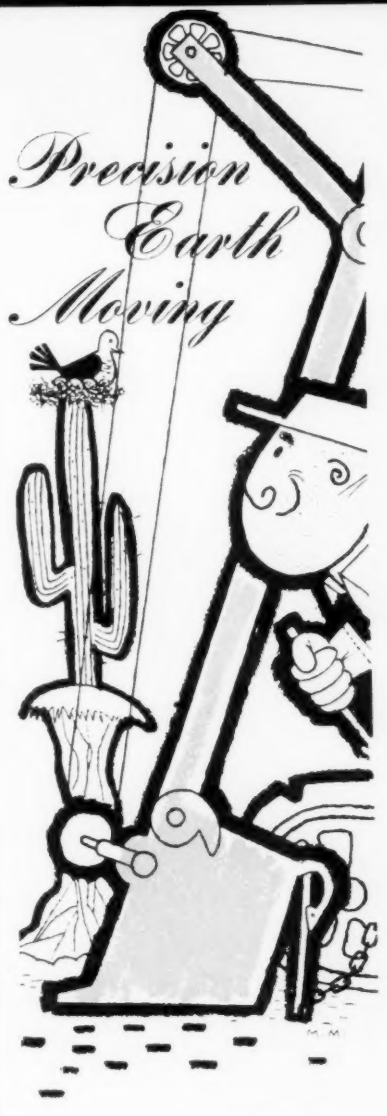
ON THE COVER

The cover picture and the article on page 30 outline the problems of "wet mining" at Ambrosia Lake's deep uranium mines. Read the article to find out what a "wet mine" is, how they are being developed, the mining problems, and how they are being solved. See how the water drips and drips from the back and flows down the drift in Homestake-New Mexico Partners' Section 32 mine.

MILLER FREEMAN PUBLICATIONS



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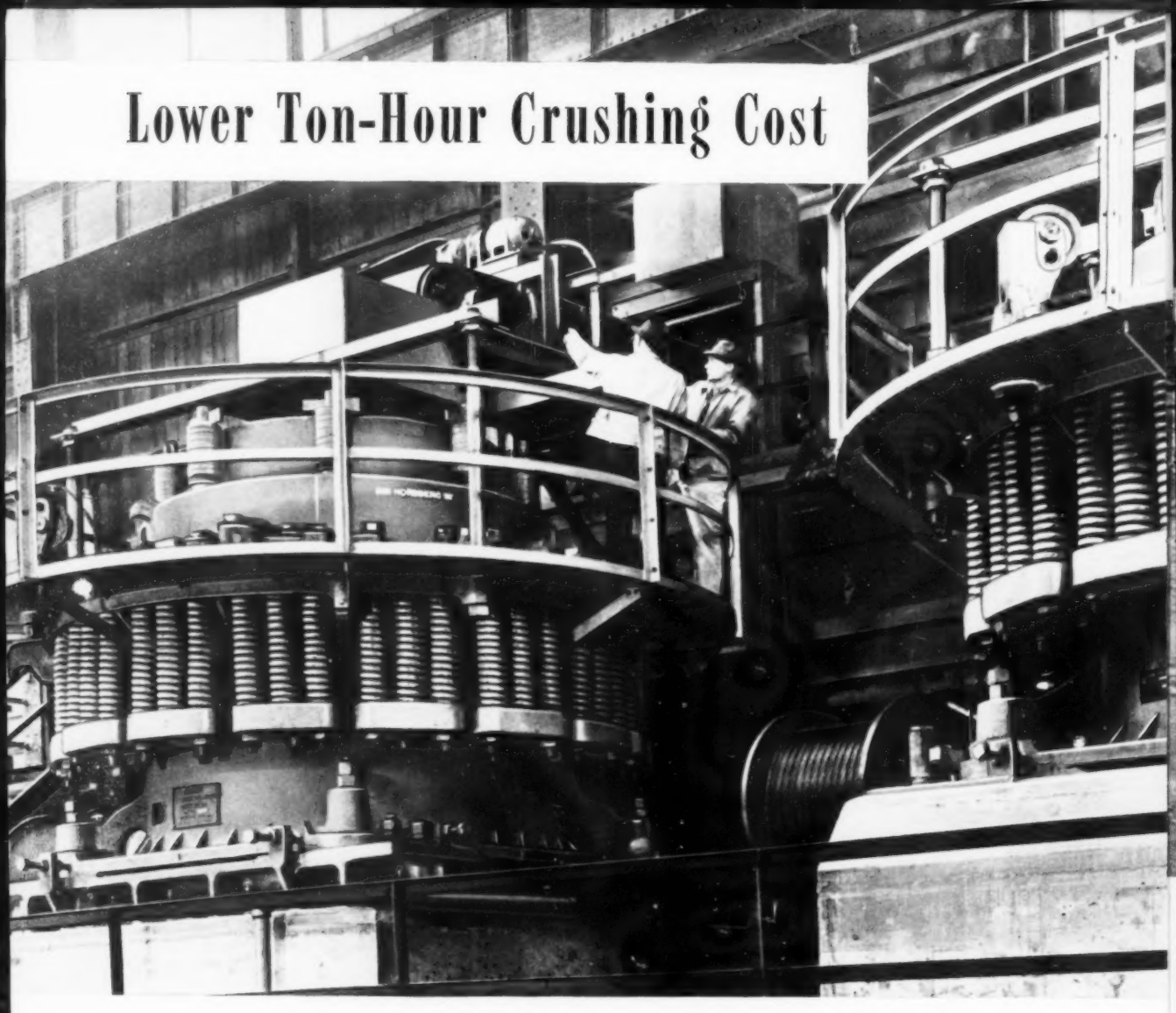

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You can get up to 900 or more tons per hour per unit . . . Symons Cone Crushers consistently deliver large tonnages of crushed product. Positive setting and a carefully designed crushing cavity assures uniformity of product.

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MILLER FREEMAN PUBLICATIONS

Drifts and Crosscuts

Welcome Alaska—Newest Mining State

Congressional passage of the Alaskan Statehood Bill cleared the toughest hurdle Alaska faces in becoming the 49th and largest state in the Union.

A general election must be held in Alaska before December 1 to elect officials. Alaskans must also decide whether to accept statehood, whether to join the Union immediately or later, and whether to accept proposed boundaries and retention of certain powers by the United States. This will take several months.

Statehood will mean more mining activity. Population will grow; there will be more people to prospect; and, most importantly, more people will use more minerals—particularly fuels, structural, and insulating minerals.

Mining was instrumental in building Alaska and mining will make it grow. All existing mining claims, permits, leases etc. will remain valid under statehood. Alaska has 25 years in which to select 102,550,000 acres of vacant and unappropriated public land to establish a tax base. This state may, and surely will, open these lands for mineral development. And mining companies feel that the State will be more friendly to mining.

Alaska has gold, uranium, coal, mercury, platinum, chromite, and antimony mines. Major exploration projects are underway for copper and iron. Other minerals will be found—and mined.

The Territorial Department of Mines has an excellent record of mineral deposits. The officials are always willing to advise about mining.

Prospectors, miners—go north to the new state of Alaska.

West Needs More of These Programs

During this period of reduced exploration by many companies and the short sighted belief that development of already explored ore bodies is not warranted in the face of mounting metal stockpiles, any new exploration project is news.

The joint exploration project and geological mapping just started in northwestern Montana is important news, too, for this project is financed by companies operating and doing business in the area—Great Northern Railway Company and Pacific Power & Light Company—who are cooperating with the Montana Bureau of Mines and Geology.

The objective, bluntly speaking, is more business for both the railway and power company. They both know that the best way to stimulate the economy of western Montana is to find and produce more minerals.

The Montana Bureau reports, "large areas of Flathead and Lincoln and northern Lake counties have not been adequately explored to determine the mineral resources, nor have they been adequately mapped." The companies don't want to go into the mining business; they want to help independent prospectors in the search for mineral raw materials.

This is a good plan. Aid and advise the local prospectors. Northwestern Montana is no different than many many other areas in the west that are dependent on raw material production for livelihood.

Good prospecting!

"BIGGEST" OPEN PIT OPERATION IS HANDLED BY CAT MACHINES

Cat DW21 (Series C) Tractor with Athey PR21 Wagon removing overburden in an open pit copper mine in Northern Rhodesia. Their speed and power make them fast, dependable producers.

With a spread that includes 26 of all types of Cat machines—working the largest open pit copper mining operation in Africa—a mining company in Northern Rhodesia is excavating 600,000 tons of earth and ore per month.

This owner has purchased Caterpillar machines because of their ability to keep going 23 hours a day (one hour required for servicing)—with a minimum of down time. A matched fleet of Cat DW20 (Series E) and DW21 (Series C) Tractors with Athey Trailers spearheads the job, and has the speed, guts and capacity that add up to a low cost-per-cu.-yd. figure.

Cat wheel-type Tractors have always had the rimpulls and fast-cycle potential to enable owners anywhere to meet production dates at an operating profit. Now new DW21 (Series D) and DW20 (Series F) Tractors are available. They feature the new Cat Super-Turbo Engine—that produces 320 HP (maximum output) and 28% torque rise!

Athey Trailers feature low center of gravity and plenty of ground clearance for excellent roadability. And both the Caterpillar and Athey units have the built-in dependability to get the job done without costly lay-ups for major overhaul.

Remember, your operators and mechanics prefer Cat machines. End result is: greater efficiency—high production from your crews.

Get in touch with your Caterpillar Dealer TODAY for a demonstration. He will explain why resale and trade-in values stay high. Standardize with Cat machines; stand to make more profit on the job.

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THE ONLY COMPLETE TRACTOR-TRAILER LINE... BY THE LEADERS

MINING WORLD NEWSLETTER

Quebec . . . Sardinia . . . Wyoming

August 1958

Mattagami is the new magic name in Canadian mining.

A mad scramble for ground along the Allard River in the Mattagami district of northwestern Quebec has been touched off by the New Hosco Mines copper find which appears to be a major discovery. All the well known names in mining have entered the area: Phelps Dodge, Kennecott, Newmont, Ventures, are only a few.

An all-time trading volume record was set in the Toronto stock market when 15,600,000 shares changed hands in one day. Ten percent of the trading was in one stock—New Hosco, and the fever spread to others optioning in the Mattagami area.

An airborne magnetometer and electromagnetic system located the fabulous new Mattagami copper-lead-zinc-silver district.

Geochemical analyses of soil spotted the recently located Craigmont copper-iron deposit in British Columbia.

U.S. geologists now are taking a second look at geophysical techniques because of these recent Canadian successes.

Major U.S. mining firms are employing growing numbers of geophysicists in their exploration departments.

Incidentally, MINING WORLD's Editors selected Mattagami as Foreign Geophysical Discovery of 1957 in the January 1958 issue, and as one of the major Foreign Discoveries of the Year.

Other new developments around the world:

A tin deposit has been located in the island of Sardinia, and mining rights have been obtained by Societa Mineraria Prealpina, which operates in northern Italy.

Utah Mining Company expects to sink a three-compartment shaft in the Shirley Basin uranium area, 60 miles south of Casper, Wyoming.

Ndola Copper Refineries, a subsidiary of Roan Antelope, has started up the first section of its new electrolytic refinery in Northern Rhodesia.

Meramec Mining Company has sunk its new shaft in Missouri more than 500 feet on its way to 3,000. Actual mining is not scheduled until 1961 or 1962 at the $30,000,000 iron ore project.

The West's first taconite plant is still a very active subject.

Columbia-Geneva Steel Division of U.S. Steel Corporation has its design contractor hard at work making detailed drawings for its Atlantic City iron ore project in Wyoming. Reportedly, letters of intent have been issued to equipment suppliers.

Field activity has increased. Land, water, railroad, and ore rights have been well secured.

Will 1959 be the "go ahead" year?

Don't forget the big American Mining Congress show in San Francisco next month.

Mineral policies will be deliberated with government officials.

Technical sessions will discuss underground and open-pit mining, exploration and geology, milling, metallurgy, and other important subjects.

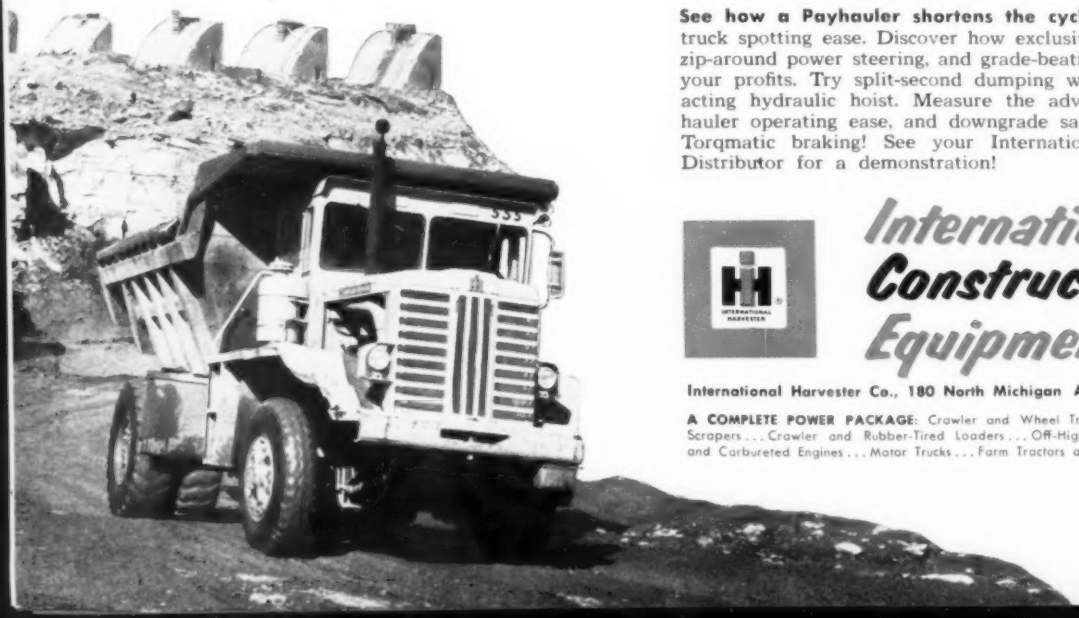
Over 170 firms will be represented in the largest exposition of machinery and equipment for use in metal mining and the industrial minerals industry.

All of this will be previewed for you in the September issue of MINING WORLD.

PAYHAULER FLEET
whips 17% grade with bonus loads

The Caldwell Engineers' five-unit 65 Payhauler® fleet highballs 2,500 cu yd of shot rock 1,000 feet daily up a haul road with 17% average grade. That's how this subcontractor keeps on schedule! His contract calls for excavating and crushing 165,000 tons of rock on the $13,000,000 hydro and flood control Oliver Dam under construction at Columbus, Ga.

Making the 17% grade with bonus loads is routine for the Payhauler fleet on this newest of all dams being built by the Georgia Power Co. at Columbus.



"These are crooked haul roads," reports excavation foreman Dudley Rabb, "but our Payhauler fleet is whipping them to keep us on schedule. The rigs haul through axle-deep water 50% of the time...make pull-outs up roads that rise 170 feet in 1,000 feet...yet speed bonus loads to crusher and stockpile."

Prove the get-away surge, and up to 25% faster haul speed of an International Payhauler—the result of bonus turbo-charged diesel power; road-matched and load-matched gear choice; and the power-cushioning leverage of planetary drive axles.

See how a Payhauler shortens the cycle with pick-up truck spotting ease. Discover how exclusive high reverse, zip-around power steering, and grade-beating power boost your profits. Try split-second dumping with the double-acting hydraulic hoist. Measure the advantage of Payhauler operating ease, and downgrade safety of positive Torqmatic braking! See your International Equipment Distributor for a demonstration!

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Capitol Concentrates

Senate Approves Expanded Seaton Bill For Five-Year Minerals Stabilization

By a strong majority the Senate passed the Seaton Bill (Five Year Minerals Stabilization Plan), S. 4036 on July 11. As passed the Bill was nearly identical to the bill as favorably reported by the Senate Interior Committee.

The mining industry, while fulminating against the Seaton plan when first offered, evidently came to the conclusion that it is all the Administration will permit in the line of relief this year.

The copper industry, however, backed away from the stabilization plan entirely and supported a one-shot, one-year purchase program of 150,000 tons at not to exceed 27.5 cents per pound. It has been implied that copper will not be back again for any further type of relief, or additional stockpiling. It is to be hoped that this attitude is not too optimistic.

Attempts were made to gain approval for a lead-zinc stockpiling program in addition to the stabilization plan for lead and zinc. The Administration strongly opposed this proposal both on the grounds of expense and the feeling that the previous stockpile purchases did not support the market prices satisfactorily. It was also brought out that much of the material now overhanging the market is of foreign origin, although smelted here. The considerable expense of about $55,000,000 would have added to the already considerable difficulty of passing a bill. The committee compromised by raising the Seaton stabilization prices by 0.75 cent—from 14.75 cents to 15.5 cents in the case of lead and from 12.75 cents to 13.5 cents in the case of zinc. It was felt that this would give a satisfactory climate in which lead-zinc mines could operate, without a purchase program.

Also added to S. 4036 was a variation of the Allott formula for small lead and zinc operators. This provides additional payments for the first 500 tons, per quarter, of all production, with a top stabilization price of 17 cents per pound for lead and 14.5 cents per pound for zinc, varied by a rather complex formula. These additional payments are across-the-board to all producers. The total yearly quantities eligible for stabilization payments are 350,000 tons of lead and 550,000 tons of zinc. The regular stabilization bonus payment limit was set at 3.9 cents per pound for lead and 2.9 cents for zinc.

The stabilization bill as reported by the Senate Interior Committee will include 180,000 tons of acid-grade fluorspar. The stabilization price was set at $53.00 per ton and the bonus limit was adjusted to $13.00 per ton.

The Seaton tungsten program of 375,000 short ton units at a stabilization price of $36.00 per short ton unit and a payment limit of $18.00 per short ton unit was approved. In addition, a sop was thrown to very small producers by adding $4.00 per short ton unit to the $18.00 limit for producers of up to 1,000 units per year. This is not across-the-board. The additional payment will go only to the small producer. It seems doubtful that many, if any, small producers will go back into business at these prices and bonuses. It has been estimated that not more than half a dozen large producers can operate at the $36.00 per short ton unit price.

It must be remembered that the Seaton plan, outside of copper, contemplates that the materials must be sold before the subsidies are collected. In the case of tungsten this might present some difficulty.

S. 4036 will probably meet some determined opposition on the House floor from those who do not like subsidies and from those who are economy-minded. There is, however, a chance that the Western bloc can swing the votes. Financing of the program calls for the Interior Department to borrow money from the Treasury Department to placate opponents wishing to hold down appropriations.

• Appropriation Made For Up-Grading

In a somewhat unprecedented action, the Senate Appropriations Committee of its own volition added $10,500,000 to the Independent Offices Appropriation bill for the Office of Defense Mobilization "to provide funds for beginning a program of up-grading materials in the stockpile and have them ready for immediate use. . . ."

Compared with the eventual cost of up-grading and/or converting the stockpiled materials to the best usable form, this appropriation is only a drop in the bucket. At the same time, it is the first real move in a very right direction. It is what the Congress intended when the Stockpile Act of 1946 was passed.

Until now, the various government agencies have not requested money for up-grading and, even now, this is a spontaneous action on the part of the Senate Appropriations Committee. It is to be hoped the House will go along.

• DMEA Extension Passes Senate

The Senate by voice vote passed S. 3817 to continue the Defense Minerals Exploration Administration. Under the bill DMEA would become part of Interior Department with funds for its activities included in regular Interior appropriations.

House action may be slow. In the meantime, the DMEA organization will be held together servicing present contracts. The fine work of the DMEA is well known and its continuation is of great importance to the industry.

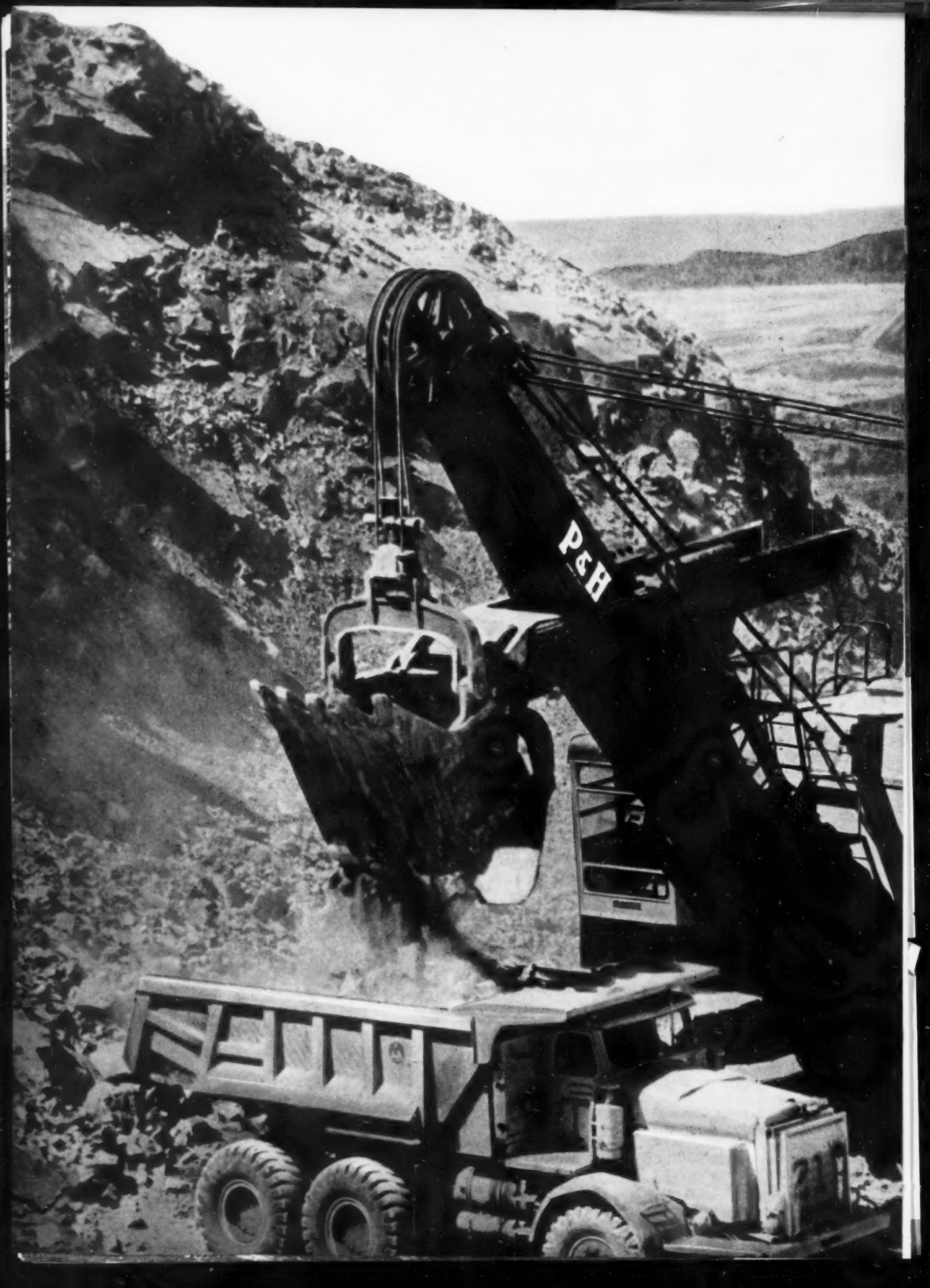
• Where Do We Go From Here?

Times do change! On March 26, 1954, when President Eisenhower rejected the idea of increasing lead and zinc tariffs and instead instituted the Stockpile Purchase Program, he remarked: "If the course of action . . . has not accomplished the objectives I seek, I will be prepared early next year to consider ever more far-reaching measures, and to make appropriate recommendations to Congress."

On June 4, 1957, the Administration recommended and transmitted to the Congress a sliding-scale tariff bill for lead and zinc with peril points of 17 cents for lead and 14.5 cents for zinc.

In April of 1958, Secretary Seaton abandoned his tariff bill in favor of a "stabilization plan" for lead and zinc and certain other minerals. On June 9, 1958, Seaton went before the Senate Interior Committee and unveiled the details of his plan, setting the stabilization ceilings at 14.75 cents per pound for lead and 12.75 cents for zinc and

Continued on page 81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If purchases are endorsement...

P&H ELECTRICS ARE THE CHOICE OF SOUTHWEST'S MINES

P&H Electrics are setting new standards of production and maintenance economy in Arizona, New Mexico, Nevada and Utah iron and copper mines. For instance, today *three or more* P&H Electric Shovels are working at *each* of 7 out of Arizona's 8 operating copper mines!

The pattern of preference for P&H among copper mine operators is especially significant. Here, industry management must constantly concern itself with selection and performance of the big shovels—the "giants" that require a large capital investment and importantly influence tonnage costs.

Reasons why P&H Electrics are a popular choice among the southwest's mines include such P&H innovations as MAGNETORQUE® and ELECTRONIC CONTROL—each of these *exclusive* P&H features contribute mightily to steady day-in and day-out high production.

Also, P&H users get single source responsibility, as P&H designs, manufactures and applies all electric rotating equipment specifically for electric shovel service.

HARNISCHFEGER

Construction & Mining Division
Milwaukee 46, Wisconsin

P&H ELECTRIC SHOVEL LINE: 3½ through 10 cu. yd. capacities

USS "T-1" Steel cut the cost of truck body liner plates by 75% because of its high resistance to impact abrasion.

Liner plates made of USS "T-1" Steel after a year's service. Note the excellent condition. Estimated life has been doubled.

How to double the life of equipment subject to impact abrasion

Hard chunks of copper ore falling into these trucks used to chew up the body liners in a hurry. And dumping a 41-ton load in 10 seconds caused terrific abrasion. The old liners wore out at a highly uneconomical rate and were costly to replace.

After trying a variety of different steels, the owners settled on USS "T-1" Steel furnished to 321 min. Brinell hardness. The bottom liner plates were 1 inch thick and the side plates were ½ inch. These plates have been taking a pounding for almost two years. None have worn out —and it is estimated that they will last more than twice as long as the *best* previously used plates. Costs of liner plates were reduced by 75%.

Other cost-saving uses. USS "T-1" Constructional Alloy Steel is being used for shovel dippers, chute liners, ore cars, skip hoist buckets, trailer frames—wherever an extra strong, weldable steel is needed. It can be furnished either to 100,000 psi min. yield strength or 321 min. Brinell hardness, so investigate USS "T-1" Steel for your next job. Deliveries are immediate. Ask too about USS High-Strength Low-Alloy Steels which have quite a history of adding life and brawn to heavy-duty equipment. United States Steel Corporation, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

USS and "T-1" are registered trademarks

United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
United States Steel Export Company

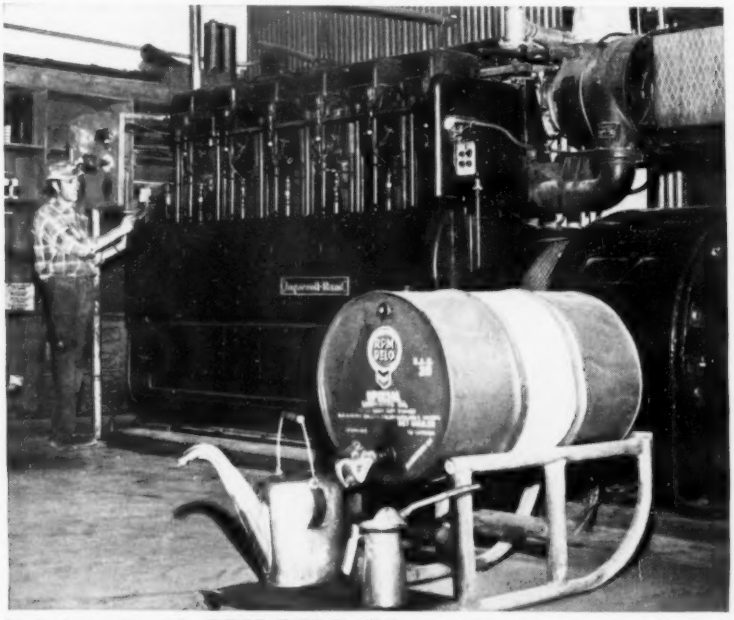
USS United States Steel

ENGINEER'S FIELD REPORT

PRODUCT **RPM DELO OIL**

FIRM **PORTER BROTHERS CORP.**
Bear Valley, Idaho

Operates 7,000 hours without measurable wear



Lubricated with RPM DELO Oil, this 650-hp Ingersoll-Rand diesel is still in nearly new condition after three years' service. "We found no carbon sludge or lacquer when we tore it down last winter," says Power Plant Foreman Bill Niece (above). "And there was no measurable wear on rings, liners or bearings, though it had run more than 7,000 hours!" Engine is in power plant of Porter Brothers Corp. Firm dredges for strategic minerals under government contract.

Trucks hauling firm's ore work 'round the clock, 9½ months a year. Despite the tough punishment of carrying heavy loads over unpaved mountain roads, RPM DELO Oil keeps engines running smoothly, and eliminates excessive wear.

Giant dredge (left) processes nearly 6,000 yards of gravel every 24 hours. "Both this and our smaller dredge depend upon our diesel-generators for power," explains Superintendent Clay La Fon (right). "That's why we do everything possible to keep them running properly...and that includes using RPM DELO Oil. We've had excellent results with it in all our equipment...in our power plant, in our trucks, and in the tractors that level our tailings and restore the areas we've worked."

Why RPM DELO Oils reduce wear—prolong engine life

- Oil stays on engine parts—hot or cold, running or idle
- Anti-oxidant resists lacquer formation
- Detergent keeps parts clean
- Special compounds prevent corrosion of bearing metals
- Inhibitor resists crankcase foaming

LUBRICATING OILS RPM DELO

TRADEMARK "RPM DELO" AND CHEVRON DESIGN REG. U.S. PAT. OFF.

For More Information about this or other petroleum products or the name of your nearest distributor, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

ONLY CATERPILLAR GIVES YOU

THE OIL

Here is what you should know about its money-saving and operating advantages

How much better is the exclusive Caterpillar oil clutch than the ordinary clutch? It can be summed up in this short statement:

When the Caterpillar oil clutch is ready for *adjustment*, the ordinary clutch is ready for *replacement*. Experience in the field proves it.

In the years since 1954, when Caterpillar introduced this remarkable advance in earthmover power trains, owners all over the country have reported thousands of hours of oil clutch operation free of adjustment or repair.

Typical of these reports is this one from Myron Omernik, land improvement contractor of Custer, Wis.: "Our D7 has operated 5,100 hours without any oil clutch repairs or adjustment."

This performance record means two clear-cut money-saving advantages:

1. Virtual elimination of down time caused by clutch failure.

2. Greatly reduced repair costs.

But in addition to its economy features, the oil clutch also provides superior operation. Here is why:

1. A hydraulic booster on the D9 and D8, operated by clutch oil pump pressure, takes the effort out of clutch operation but retains clutch "feel."

2. Clutch "fade" because of overheating is practically eliminated. The oil in which the clutch parts run is pumped directly from the crankcase. This means the clutch temperature never rises above engine temperature.

3. A clutch brake helps match clutch and transmission speeds—making shifting easier.

Here, in brief, is how the oil clutch works:

Three metallic-faced plates are separated by oil films at all times except for the last revolution or two as the clutch is engaged. Oil enters the inner diameters of the clutch plates and circulates between them by means of grooves in the clutch facings, carrying away heat and reducing wear. All clutch parts are constantly running in oil.

The exclusive Caterpillar oil clutch is not an "extra"—it is *standard equipment* on the D9, D8, D7 and D6 Tractors, all Traxcavators, on the No. 12 Motor Grader and on the MD6 and MD7 Pipelayers. Yet it is an "extra" in *value* that is unmatched in the industry.

Caterpillar Tractor Co., San Francisco, Cal.; Peoria, Ill., U.S.A.

IMPORTANT OIL CLUTCH FEATURES

Independent oil pump assures positive lubrication and cooling for clutch plates, bearings and other vital moving parts.

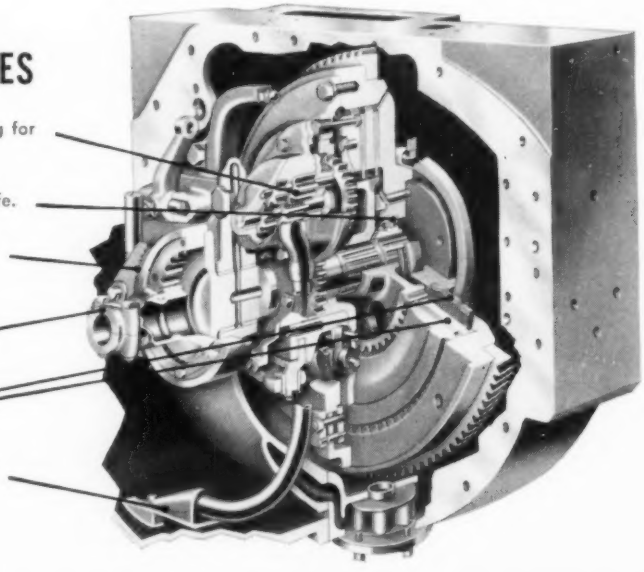
Heavy-duty bearings have extra capacity for long service life.

Clutch brake helps match clutch and transmission speeds—makes shifting easier.

Removable coupling allows clutch to be removed without disturbing engine or transmission.

Double clutch plates are metallic-faced for heavy-duty torque transmission.

Intake screens protect the oil pump from foreign material.



CLUTCH

CAT D9 TRACTOR: "We have operated this Cat D9 Tractor for 4,000 hours in the toughest kind of work without any repairs to the oil clutch," says Frank Hill of the Silva & Hill Construction Co., Los Angeles, California. "I just wouldn't consider buying a tractor without it now."

CAT NO. 955 TRAXCAVATOR: "In over 4,000 hours on our two hard-working No. 955 Traxcavators, we have made only one simple adjustment on an oil clutch and that took only about a half hour. It's much simpler than the old friction-type clutch," says M. J. Lutz of Bethel Park, Pennsylvania.

OWNERS REPORT TROUBLE-FREE OPERATION

CAT NO. 12 MOTOR GRADER: "Our No. 12 is starting its third season without interruption due to clutch trouble." With only one clutch adjustment in over 2,000 hours, Francis Bloomer, President of the John F. Bloomer Co., Appleton, Wisconsin, says, "We like the No. 12 with the oil clutch." This company, with 35 years of road construction work, owns a fleet of Cat-built equipment consisting of No. 12s, D9, D8s, DW21s.

CATERPILLAR

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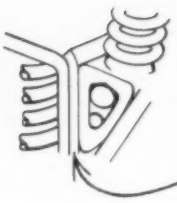
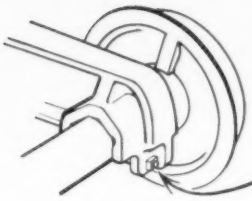
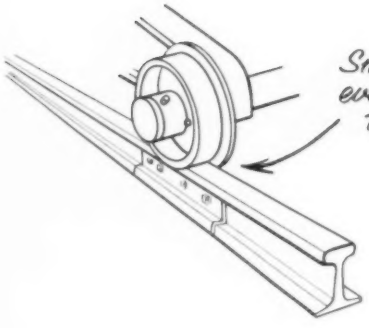
LEADER IN EARTHMOVING RESEARCH



Movement between bolster and side frame is taken on specially designed wear surfaces

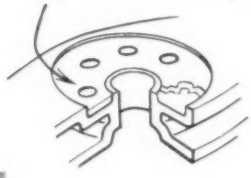


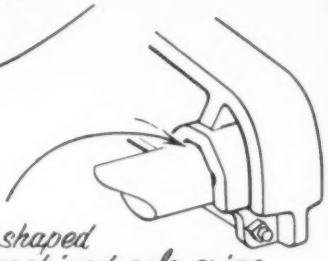
Quick wheel change



Smoother ride even on rough tracks

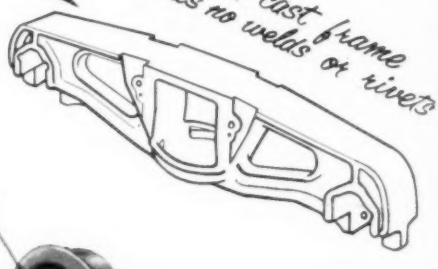
Large center bearing for longer life





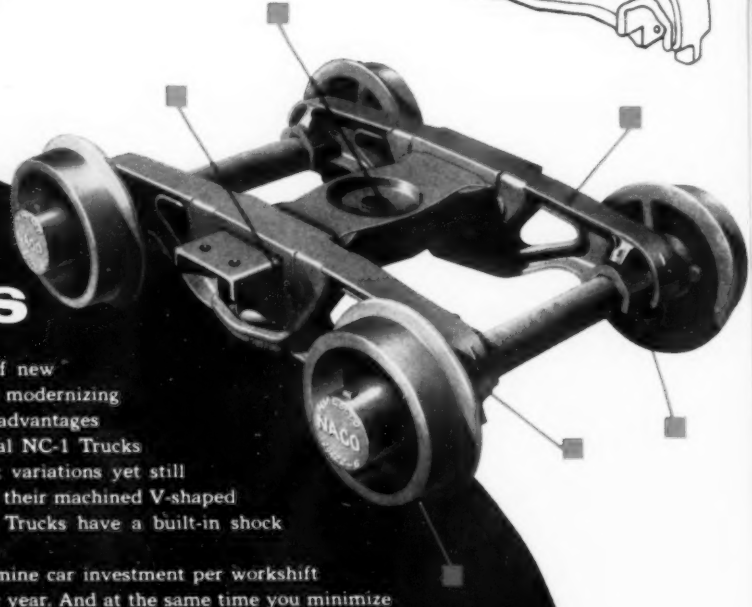
V-shaped machined axle grips for controlled flexibility and truck alignment

Integral cast frame has no welds or rivets



Check these "plus" features

OF NATIONAL NC-1 TRUCKS



If you're considering the purchase of new 8-wheel mine cars . . . or if you're thinking of modernizing older cars—*now* is the time to check the advantages of National NC-1 Trucks. National NC-1 Trucks have controlled flexibility for track variations yet still maintain truck alignment through their machined V-shaped axle grips. In addition, NC-1 Trucks have a built-in shock absorbing mechanism.

You get more out of your mine car investment per workshift . . . per day . . . per year. And at the same time you minimize spillage . . . get greater protection for your equipment, track and structures . . . slash maintenance to a new low.

Yes, *now* is the time to check National NC-1 Trucks—they make sense for 8-wheel mine cars . . . *make dollars for operators*, too.

- WILLISON AUTOMATIC COUPLERS
- RUBBER CUSHIONED UNITS
- NC-1 CAR TRUCKS • NACO STEEL WHEELS
- NACO STEEL LINKS & SWIVEL HITCHINGS

AA-5077

See the NC-1 truck at Booth 115, Metal Mining Show San Francisco—September 22-25

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Established 1868 *Cleveland 6, Ohio*

CYANAMID

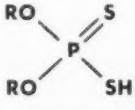
REAGENT NEWS

"ore-dressing ideas you can use"

AEROFLOAT® Promoters May Help You If Low Metal Prices are Pinching-- Concentrate Grade or Recovery is Troubling You

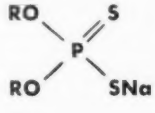
An experienced Cyanamid field engineer will be glad to work with you in your mill to help you improve metallurgy and get lower cost-plus-tails with a Cyanamid reagent combination, utilizing the AEROFLOAT Promoters. These collectors are usually much more selective in their collecting action on sulfide and precious metal ores than are the xanthates.

Liquid AEROFLOAT Promoters are essentially water-insoluble organic liquids based on the dithiophosphoric acid structure



where R is a phenolic ring. They exhibit some frothing properties.

Dry AEROFLOAT Promoters are water-soluble solids which are essentially non-frothing. They are sodium salts of alkyl dithiophosphoric acids.



where R is hydrocarbon chain.

The AEROFLOAT Promoters are often very effective when used together with xanthates or the 400 Series AERO® Promoters. AEROFLOAT Promoters are also noted for their selectivity toward copper, lead and zinc sulfide which they will generally float away from pyrite in neutral or low alkaline circuits.

In these times of low metal prices it will pay you to check the AEROFLOAT Promoters. Contact our nearest office or representative for further information.

AMERICAN CYANAMID COMPANY

EXPLOSIVES AND MINING CHEMICALS DEPARTMENT

CYANAMID INTERNATIONAL — *Mining Chemicals Department*
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30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

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Toronto 1, Ontario, Canada

CYANAMID DE MEXICO, S.A.
Apartado Postal 263
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Bush House, Aldwych, London W. C. 2, England

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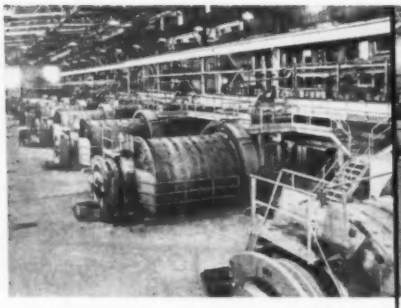
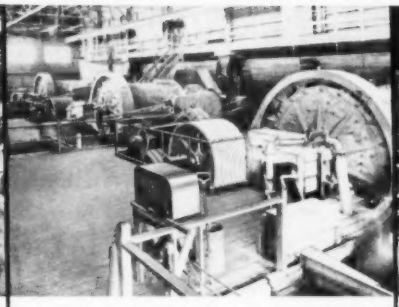
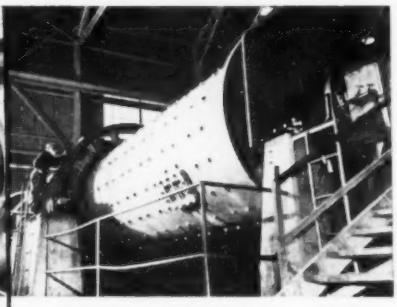
CYANAMID AUSTRALIA PTY. LTD.
"Collins Gate"
377 Little Collins Street
Melbourne, Australia



This large copper company has 17, 9½'x 12' and three 10'x 14' Marcy Open End Rod Mills; three 8'x 12' and three 10'x 12' Marcy Grate Discharge Ball Mills.



Three 8'x 9' Marcy Grate Discharge Ball Mills in a large copper mill.

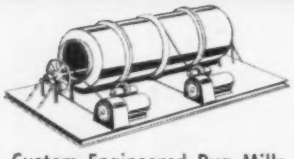


This 8'x 20' Marcy Pebble Mill is one of 21 Marcy Mills used by a molybdenum company.

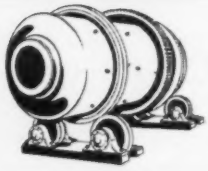
Marcy Grinding Mills

- grate discharge ball mills, open end rod mills, tube mills, pebble mills, center and end peripheral discharge rod mills, acid-proof mills, batch mills.
- for metallic and non-metallic ores, cement, specification sands, clay, fibrous material.
- wet or dry grinding.
- 29 different diameter sizes, from 12" to 12'6" inside diameter, are operating and proved in the field.
- grind material 1½" or finer to a product as fine as 325 mesh.
- capacities up to 6650 tons per 24 hours.

Other Products

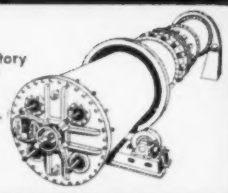


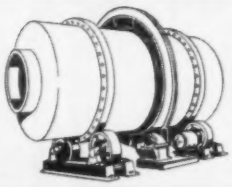
Custom Engineered Pug Mills.



Custom Engineered Leaching Drums.

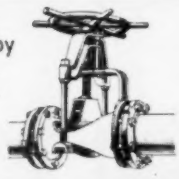
Burt Filters.
30"x 72" Laboratory Unit, and 5'x 40' Standard Commercial Size.

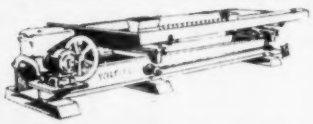




Custom Engineered Fusion Furnace.

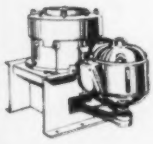
Massco-Grigsby Pinch Valves. 1" to 14" dia.



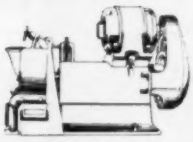


Wilfley Concentrating Tables.
Laboratory and Commercial Sizes.

4"x 6" Massco Laboratory Jaw Crusher.



6" and 10" Massco Gy-Roll Reduction Crusher.



Massco-McCool Pulverizer.

Marcy Direct Reading Pulp Density Scale.

THE MINE AND SMELTER SUPPLY CO.

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SALES AGENTS AND LICENSED MANUFACTURERS THROUGHOUT THE WORLD

MARCY®

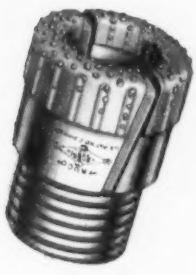
HIGH salvage–a built-in "extra" in every Truco Bit

The scoop of diamonds in the foreground represents one of the important sources of savings when you use Truco Bits—salvage, *high* salvage.

High salvage had its first beginning many years ago when Truco engineers developed the remarkable matrix metal in which Truco diamonds are held in a chemical as well as physical bond. The tenacity of this bond greatly reduced diamond loss, kept more diamonds cutting longer and deeper and yielded more salvage.

Getting the salvable diamonds out of this matrix without damaging them was the next problem and it was solved by Truco engineers developing a process in which the matrix metal is dispersed by electro-chemical action and the diamonds are released. When perfected, this process was adopted by the entire industry.

Above, right: a new three-inch bit ready for use. Center: a bank of salvage tanks in which used bits are being processed. Below, left: a used three-inch bit after the salvage process and salvaged diamonds which will be reset "best face to the work" as always in Truco Bits. Thus, through high salvage and expert resetting, the diamonds in your Truco Bits give you additional footage and additional economies which can be an important factor in reducing your operating costs. Try a Truco and see for yourself.



TRUCO DIAMOND BITS *by*

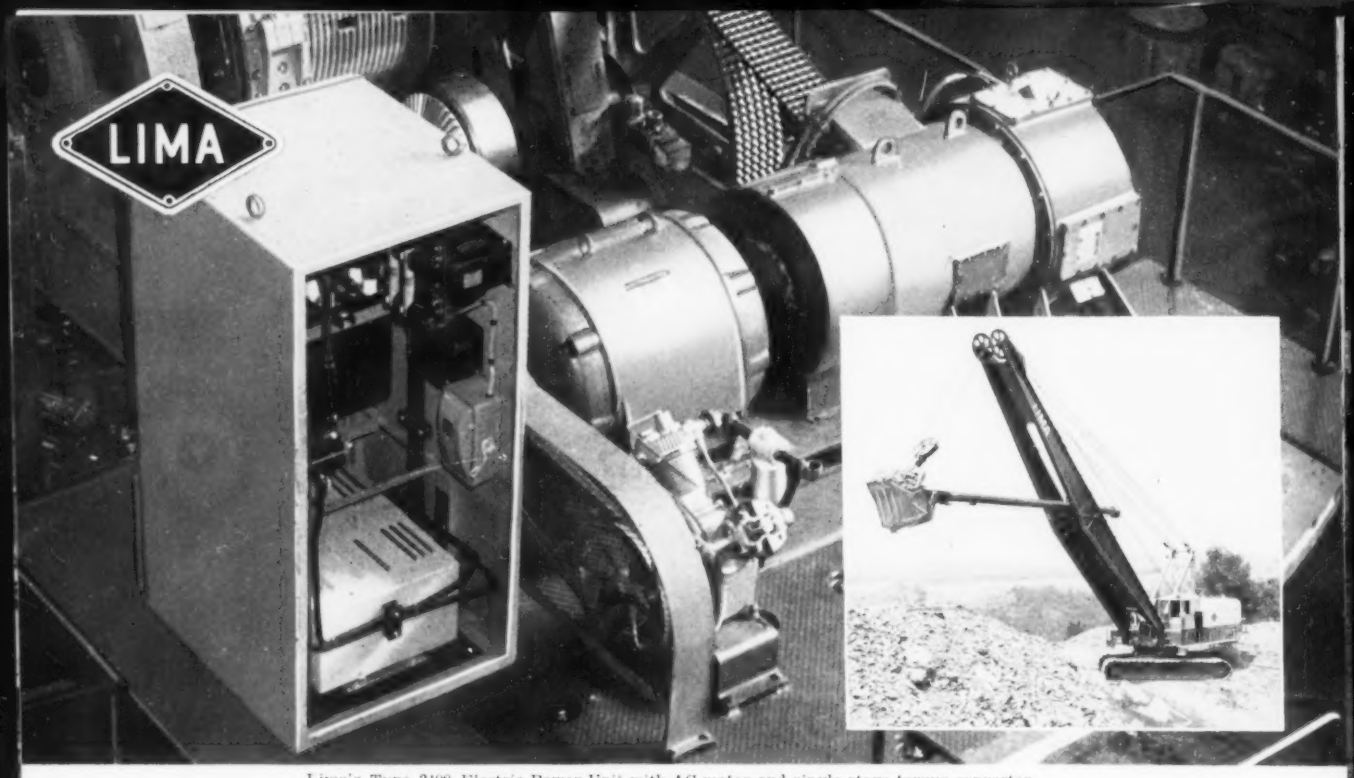
WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue, Detroit 38, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.

575 Langlois Avenue, Windsor, Ont., Canada

MEMBER Diamond Core Drill Manufacturers Association



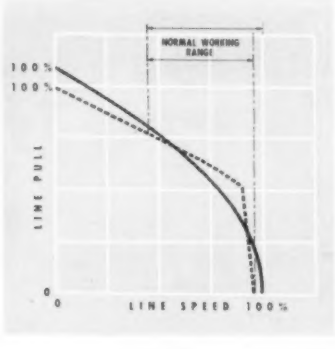
Lima's Type 2400 Electric Power Unit with AC motor and single-stage torque converter.

LIMA'S Electrical Power Unit prevents stalling, won't burn out

With Lima's optional power unit, you get power on demand through a wide operating range, and the motor will not stall or burn out under heavy load conditions. Combining an AC motor with a single-stage torque converter, it adapts actual power output to work load demand—at constant motor speed. Thus, electrically it matches diesel-torque converter performance.

Just check the performance curves—They make it clear that LIMA's new electric power unit is the perfect answer when your job calls for electrically powered machines. Available on every Lima machine—shovels to 6 cu. yds., cranes to 110 tons.

Get the full story today from your nearby Lima distributor. Or write to Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.



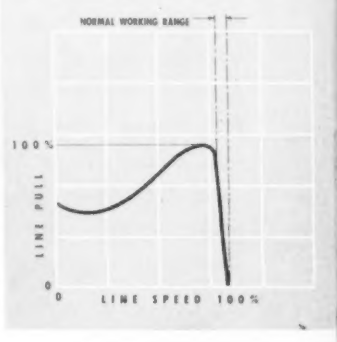
Power Performance of LIMA'S Optional Electrical Power Unit.

Power performance curve of Lima's electrical power unit (solid line) compared with that of a diesel-torque converter unit (dotted line). As can be seen, the line pull will constantly increase through a long pull down in speed range, depending upon the load applied. Even under extreme loading the motor will pull down in speed only slightly and can never be stalled.

Power Performance: AC Electric motor with direct drive—

The motor speed and torque varies as shown for line speed and pull.

With a pull down in speed of only 3% to 5%, torque rises too fast. The motor will stall quickly after peak torque is reached. Workable speed range is small, stalls are frequent.



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Cable Address: LIMASHOVEL, Lima, Ohio, U.S.A.

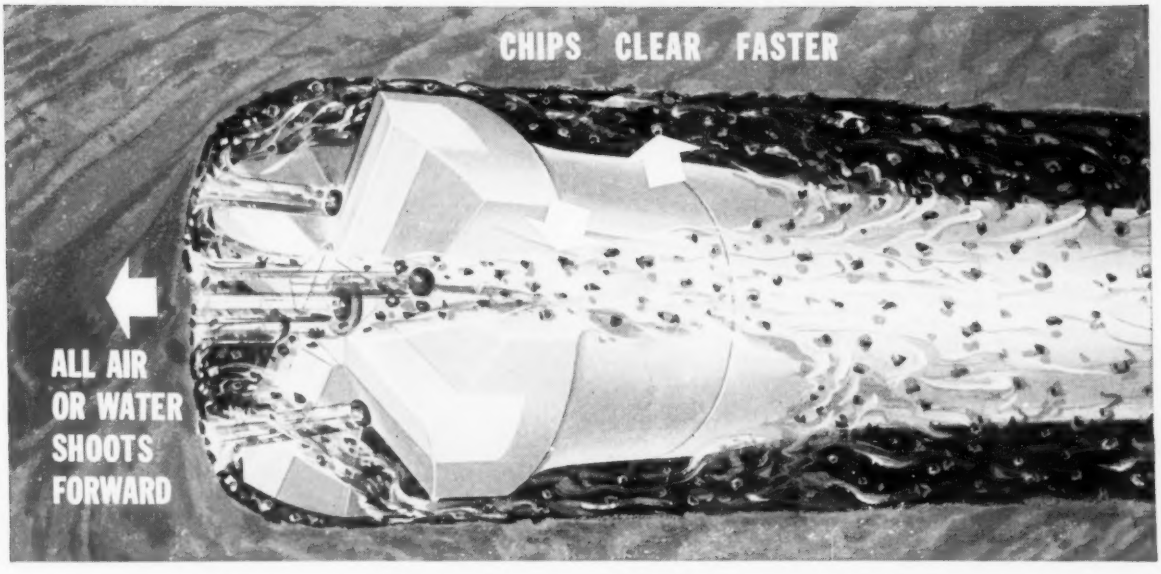
LIMA Construction Equipment Division, Lima, Ohio

BALDWIN · LIMA · HAMILTON

Shovels • Cranes • Draglines • Pullshovels • Roadpackers • Crushing, Screening and Washing Equipment

5827

BALDWIN BLH LIMA-HAMILTON



How new TIMKEN® threaded bit cuts drilling costs on drifters, sinkers and stopers

SPEED DRILLING and cut bit costs with these new Timken threaded bit features. 1) New five front holes and 2) wider wing clearance speed chip removal; and 3) new wear-resistant carbides give longer bit life.

The action picture above shows how you can cut drilling costs on drifters, sinkers and stopers. The new Timken® threaded carbide bit drills more hole-per-bit because two new features clear chips faster. 1) Newly-positioned five front holes shoot air or water *directly* against the rock face; and 2) deeper, wider wing clearance lets chips wash back faster. Deeper relief under the heel provides an even freer passage. As a result, the bit spends less time "drilling" chips, more time drilling rock. And removing chips this faster, more economical way eliminates the problem of clogged drill steels, prevents damage to bit skirts.

What's more, the new Timken threaded bit has new special analysis carbides that give increased resistance to wear and shock. They can be reconditioned many times. And improved thread contact reduces breakage to a minimum.

To get more hole-per-bit, use the new Timken threaded carbide bit. For more cost-saving details, send for free brochure. The Timken Roller Bearing Company, Rock Bit Div., Canton 6, Ohio. Cable: "TIMROSCO".

USE THESE TIMKEN BITS FOR OTHER TOUGH DRILLING JOBS

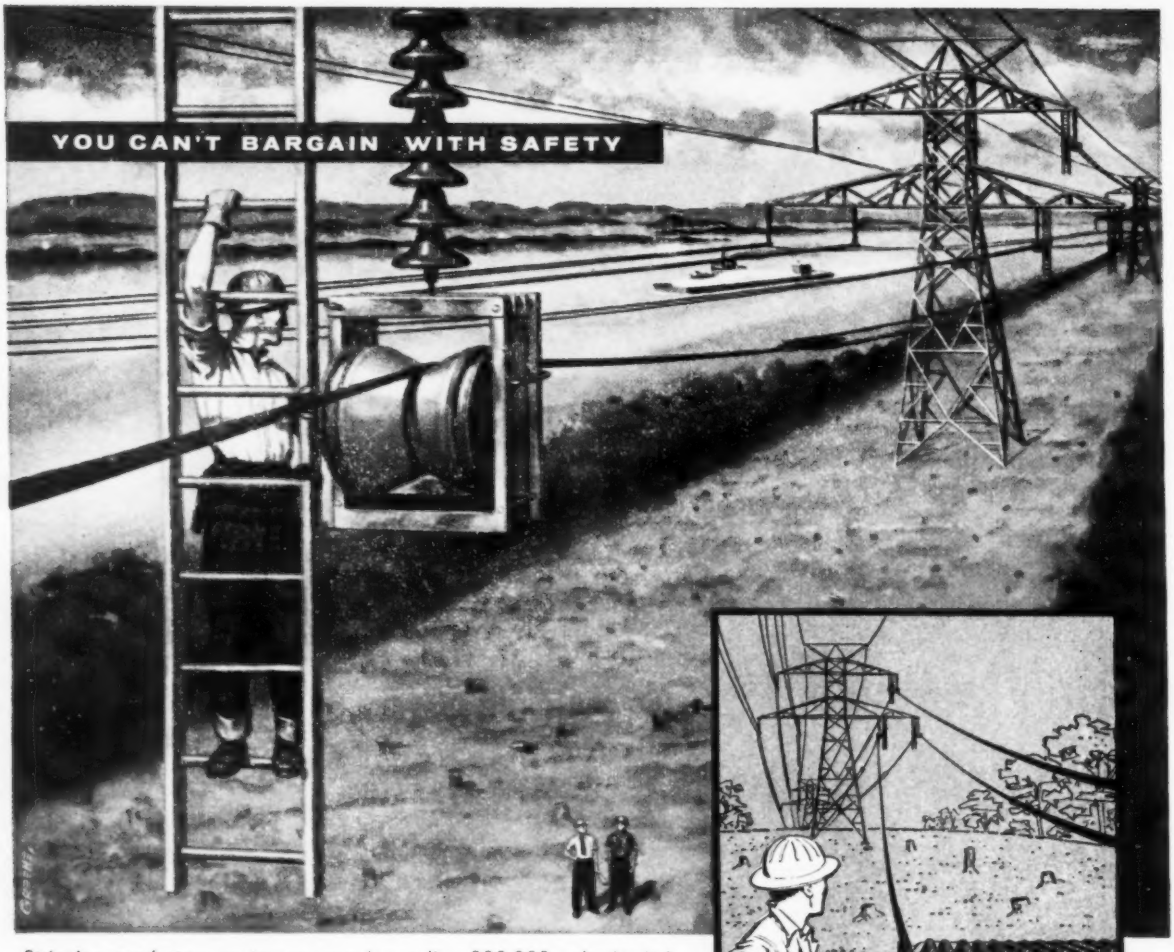
IMPROVED TIMKEN ALL-STEEL MULTI-USE BIT

With correct, controlled reconditioning, gives lowest cost per foot-of-hole when full increments of steel are used.

THE AIR-LEG BIT OF THE FUTURE

New Timken tapered socket bit is removable for full steel life yet tapered for one-piece strength. Same frontal features as threaded bit.

TIMKEN ***REMOVABLE ROCK BITS***



Stringing conductors on towers carrying a live 330,000 volt circuit is a tough job. Hoosier Engineering Company of Columbus, Ohio, does it by threading conductors up to 1¾" through a tension machine and pulling them over sheaves on the tower arms with 9000 foot lengths of Wickwire Wire Rope. On jobs like this, where men's lives are at stake . . .

rope failure can be fatal

Whether you're stringing power lines, pulling drill pipe, or handling other hazardous hoisting jobs—don't bargain with safety. "Bargain" wire rope can cause more trouble and expense than you expect. Buy wire rope on the basis of *quality* . . . buy Wickwire Rope.

For extra strength—buy Wickwire's Double Gray IWRC extra improved plow steel wire rope

LOOK FOR THE YELLOW TRIANGLE

CF&I

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso Farmington (N. M.) • Fort Worth • Houston • Kansas City • Lincoln • Odessa (Tex.) • Oklahoma City • Phoenix • Pueblo Salt Lake City • Tulsa • Wichita

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WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans New York • Philadelphia

5924

Steel production brings economic progress

to Union of South Africa

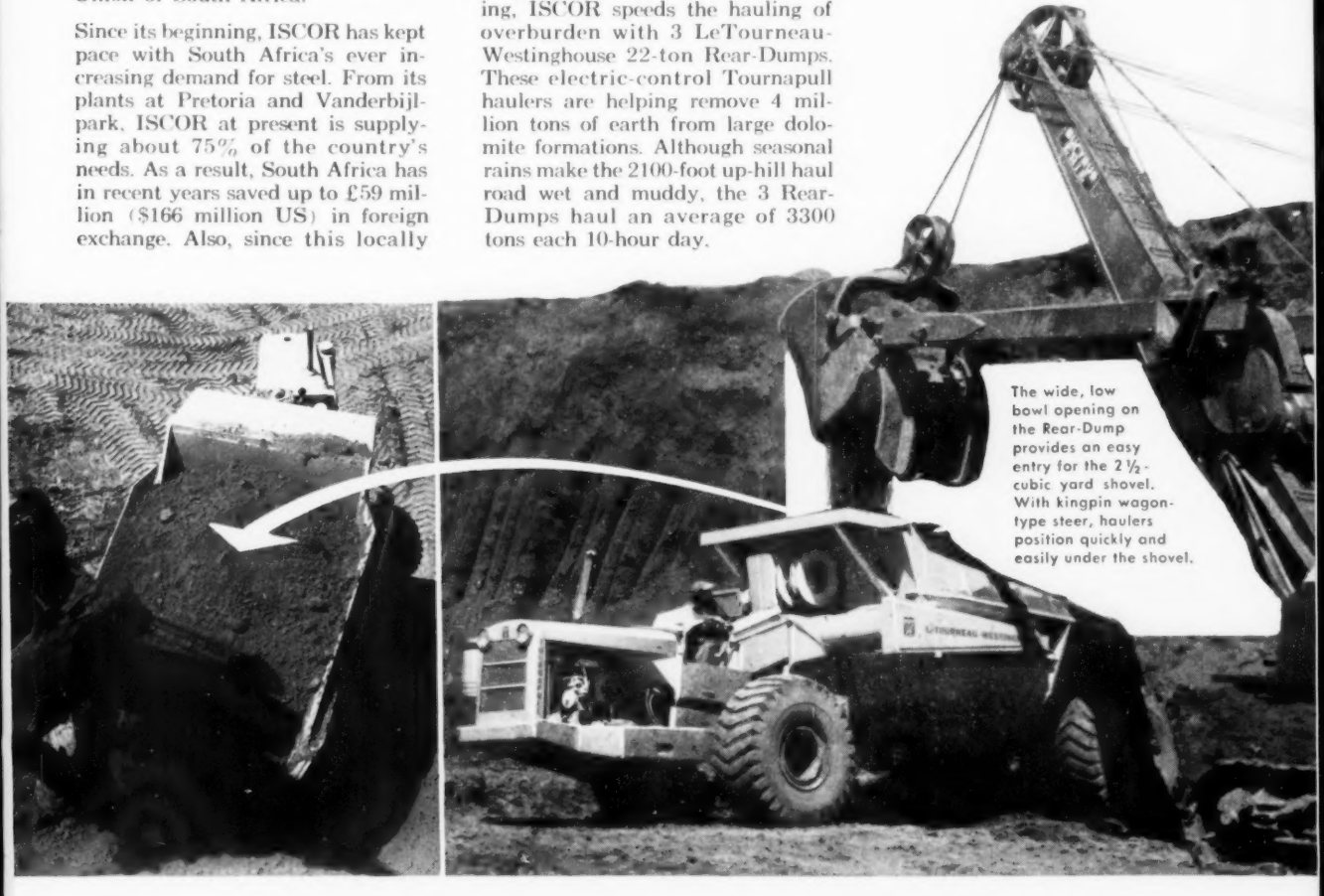
The life-blood of any modern, industrial country is steel. But, if it is necessary to import this vital material, the country's general economic progress will be hampered because of higher cost and uncertain delivery. That is why, in 1934, the South African Iron and Steel Industrial Corporation (ISCOR) was formed to produce steel for the Union of South Africa.

Since its beginning, ISCOR has kept pace with South Africa's ever increasing demand for steel. From its plants at Pretoria and Vanderbijlpark, ISCOR at present is supplying about 75% of the country's needs. As a result, South Africa has in recent years saved up to £59 million ($166 million US) in foreign exchange. Also, since this locally manufactured steel sells for less, it helps keep the cost of the country's steel products low.

Helping ISCOR achieve such an impressive production record is the firm's efficient utilization of manpower and modern machinery. For example, at its Glen Douglas Dolomite Quarry, which it operates to supply necessary flux for steel making, ISCOR speeds the hauling of overburden with 3 LeTourneau-Westinghouse 22-ton Rear-Dumps. These electric-control Tournapull haulers are helping remove 4 million tons of earth from large dolomite formations. Although seasonal rains make the 2100-foot up-hill haul road wet and muddy, the 3 Rear-Dumps haul an average of 3300 tons each 10-hour day.

Modern Tournapulls can also speed *your* haul work, at lower cost. Let us send you complete information on LeTourneau-Westinghouse Rear-Dumps. They are available in 3 sizes: 11, 22, and 35-ton capacities (9, 18, 27 cubic yards).

Tournapull—Trademark Reg. U.S. Pat. Off.
CR-1847-MQJ-1r



The wide, low bowl opening on the Rear-Dump provides an easy entry for the 2½-cubic yard shovel. With kingpin wagon-type steer, haulers position quickly and easily under the shovel.

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

No. 8 in a series

Right off the Wire

About half of this country has been converted to dial telephones and it is expected that within five or ten years, it will be possible to dial Europe or the Hawaiian Islands.

Two new developments in "fiber optics" (the use of glass or plastic fibers to transmit light around curves) are in the examination of the inside of the human body and in cryptography.

A new plastic reinforced with silica withstands high temperature better than steel.

A new technique in the use of radar antennas which involves sweeping the beam will give them a range of 3,000 miles without increasing their size.

Simplex researchers, D. W. Kitchin and O. S. Pratt, have developed techniques for taking photomicrograph movies of polyethylene insulation failures caused by excessively-high voltages.

A thermo-electric engine, based on the temperature differential between dissimilar metal plates, converts atomic energy directly into electricity with a thermal efficiency of twelve per cent.

A new machine uses the light from atoms of mercury to control the engraving of lines on diffraction gratings which must be less than a wave length of light apart. Accuracy is closer than one-millionth of an inch.

The strength of cast iron and resistance to high temperature are combined with good electrical resistance in a new ceramic.

By using a clock based on the vibration of an atom of cesium, it has been found that the length of our day has been increasing half a thousandth of a second per year.

A new television picture tube has a front of double glass with mineral oil between. This increases light transmission by reducing reflection.

A two-volt booster battery is made to supplement a regular automobile battery. It is used only in starting.

Simplex ANHYDREX XX insulation has greater resistance to deterioration at elevated operating temperatures than any natural rubber of GR-S heat resisting insulation.

A ramjet power plant for permanent earth satellites has been designed which would obtain its power from the re-combination of oxygen atoms that have been divided by cosmic radiation in the higher altitudes.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

An electron tube the size of a shirt button is made of layers of titanium and ceramic. It makes the tube competitive in size with the transistor.

An instrument for detecting radiation is said to be so sensitive that it can detect a thousandth of a gram of chromium 51 dissolved in a river.

A patent has been issued for a television set that shows two programs superimposed on one screen. The images are separated by polarizing glasses and individual earphones reproduce the sound.

A treatment for metal bearings is claimed to make it possible to run them indefinitely without lubrication. It has also been tested on power-press tools.

A three-dimensional cathode-ray tube gives a display with a depth of one mile.

A steel roller for a new paper mill is said to be the largest in the world. It is over twenty-six feet long and is forty-four inches in diameter.

Submarine cables for railroad use!

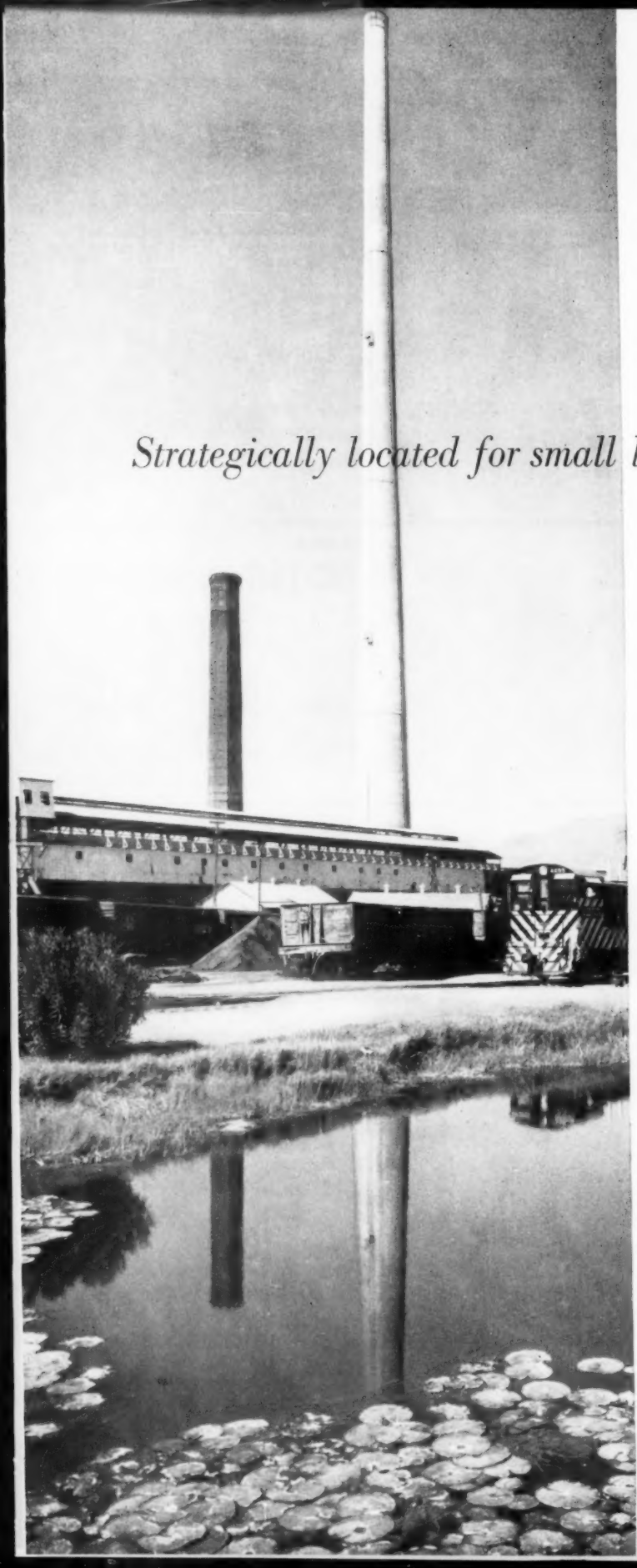
Submarine cable is required by the New Haven R.R. for the power and control of 24 movable spans at 14 railroad bridges. Old style steel armored cable suffered the ravages of salt corrosion, strong currents and constant flexing, all of which resulted in high maintenance. Replacements, as required, are made with new Simplex submarine cable, jacketed in fabric-reinforced neoprene — a product of Simplex research — a remedy for delayed service and high maintenance costs.

SIMPLEX WIRE & CABLE CO
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining · Power & Lighting · Construction · Transportation · Communications · Signalling

"The American manufacturers of transoceanic telephone cables"



See ASARCO first
buying, smelting, and
refining all types of ores:
GOLD, SILVER, LEAD,
COPPER AND ZINC ores
and concentrates, blister
copper, mattes and residues
22 Smelters and Refineries

Strategically located for small lots or carload quantities...

LEAD SMELTERS
Selby, California
Leadville, Colorado
Alton, Illinois
East Helena, Montana
El Paso, Texas
Chihuahua, Chih., Mexico
San Luis Potosi, S.L.P., Mexico

ZINC SMELTERS
Amarillo, Texas
Corpus Christi, Texas
Rosita, Coah., Mexico

COPPER SMELTERS
Hayden, Arizona
El Paso, Texas
Tacoma, Washington
San Luis Potosi, S.L.P., Mexico

LEAD REFINERIES
Selby, California
Omaha, Nebraska
Perth Amboy, New Jersey
Monterey, N.L., Mexico

COPPER REFINERIES
Baltimore, Maryland
Perth Amboy, New Jersey
Tacoma, Washington

See management
at above locations
or write to main office,
American Smelting and
Refining Company,
Ore Purchasing Department,
120 Broadway,
New York 5, N. Y.

58-54

ASARCO

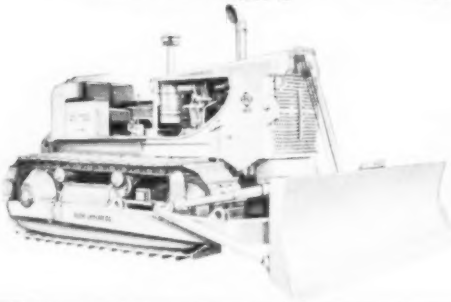
fastest growing acceptance in

Allis-Chalmers crawler tractors for every application

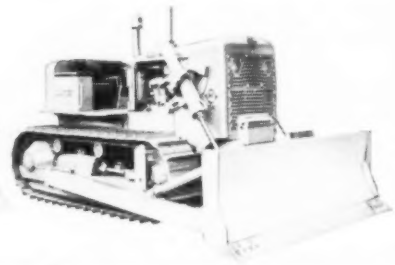
...plus a complete line of matched bulldozers, side booms, mounted rippers, other attachments.

*All weights approximately as illustrated. Twelve other tractor models available.

HD-21 225 net engine hp, torque converter drive, 56,260 lb*



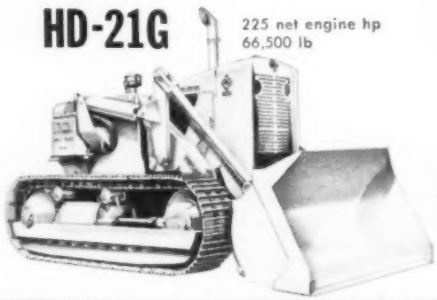
HD-16 torque converter drive, 150 net engine hp, 39,090 lb* | all-gear drive, 141 belt hp



Allis-Chalmers tractor shovels in a full range of bucket sizes...

up to 7-cu-yd capacity to match requirements for various materials and job conditions.

4-CU-YD
HD-21G 225 net engine hp, 66,500 lb



3-CU-YD
HD-16G 150 net engine hp, 47,800 lb

Allis-Chalmers motor scrapers and wagons...

five models that offer major advantages on big jobs or utility work.

TS-360
280 hp
Struck — 15 yd
Heaped — 20 yd

TW-360
280 hp
Struck — 17 yd
Heaped — 24 yd

TR-260
200 hp
Struck — 11 yd
Heaped — 15 yd

Allis-Chalmers pull-type scrapers...

the only line with low bowl, high apron lift, forced ejection in every size.

model 315
Struck — 15 yd; Heaped — 20 yd

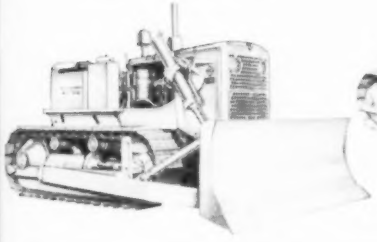
model 108
Struck — 8.4 yd
Heaped — 12 yd

model 106
Struck — 6.1 yd
Heaped — 8.5 yd

model 44
Struck — 4 yd
Heaped — 5.5 yd

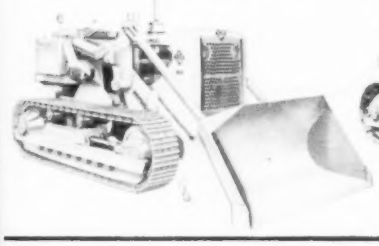
the business . . . ALLIS-CHALMERS CONSTRUCTION MACHINERY

HD-11 94 belt hp 25,960 lb*

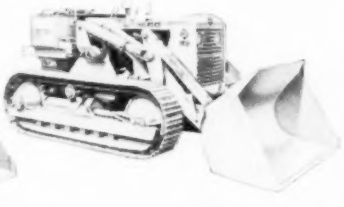


HD-6 63 belt hp 16,470 lb*

2¼-CU-YD
HD-11G 111 net engine hp 32,000 lb



1½-CU-YD
HD-6G 72 net engine hp 19,600 lb

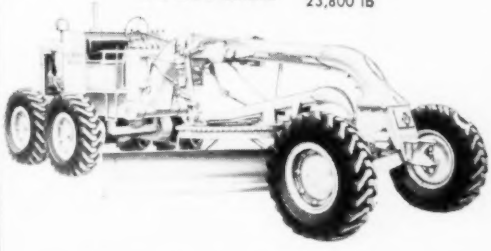


TS-260
200 hp
Struck — 11 yd
Heaped — 14 yd

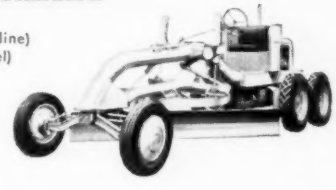
TS-160
155 hp
Struck — 7 yd
Heaped — 9½ yd

Allis-Chalmers motor graders...
designed for comfort-conscious operators and cost-conscious owners.

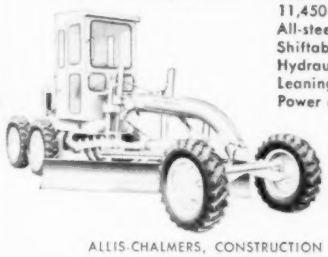
FORTY-FIVE 120 brake hp 23,800 lb



model D standard
50 brake hp
8,800 lb (gasoline)
9,350 lb (diesel)



model D special
50 brake hp
10,900 lb (gasoline)
11,450 lb (diesel)
All-steel cab
Shiftable moldboard
Hydraulic scarifier
Leaning front wheels
Power circle turn



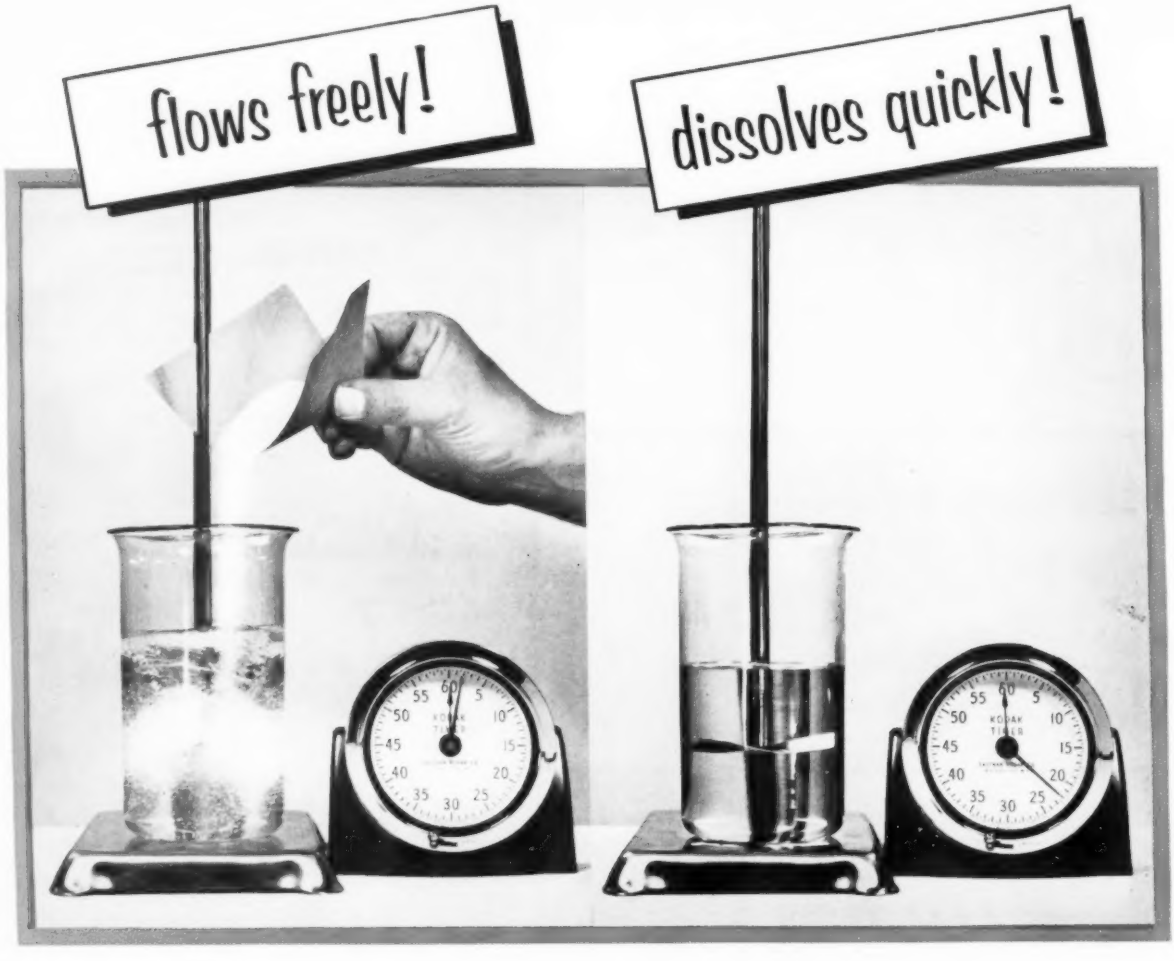
ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN

DESIGNED AND BUILT FOR HIGH-VOLUME PERFORMANCE YOU CAN DEPEND ON

Look ahead... *move ahead*...and stay ahead with ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Westvaco® SODA ASH



Here's graphic evidence of two more ways Westvaco Soda Ash helps cut your production costs!

Exceptional flowability speeds unloading and in-process handling. Rapid solubility saves processing time and labor.

Other important benefits: Westvaco Soda Ash is non-caking, dusts less, is chemically pure, low in iron and insolubles and ammonia-free.

These are real advantages. They can be yours at no extra cost within our shipping area covering two-thirds of the United States. Let us quote on a fair share of your needs.

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION

Westvaco Chlor-Alkali Division

General Sales Offices:
161 E. 42nd STREET, NEW YORK 17

INTERNATIONAL PANORAMA

OTTAWA, CANADA—The Canadian government plans to increase cost-aid to marginal gold producers by 25 percent under the Emergency Gold Mining Assistance Act.

ROME, ITALY—The Monte Amiata Company, premier mercury producer, has received Italian government exploration permits covering 200,000 acres surrounding the Abbadia San Salvatore mine. Geological geophysical, and drilling exploration are underway in the new concession area.

SODA SPRINGS, IDAHO—Monsanto Chemical Company will build a new 11.2-mile-long road from its Ballard phosphate mine to its elemental furnace plant here. The road will be specially built so that trucks can each haul 75 tons of phosphate ore.

NOUMEA, NEW CALEDONIA—Le Nickel is continuing with expansion plans to increase nickel output to 22,000 tons in 1960 and 25,000 in 1961 by developing new mines, new power plants, and new electrolytic refineries.

GRANTS, NEW MEXICO—Homestake Mining Company has placed its second uranium mill in operation to treat Ambrosia Lake ores. It is the 1,750-ton-per-day mill of Homestake-Sapin Partners.

SHINKOLOBWE, BELGIAN CONGO—The Union Minière du Haut Katanga treated 311,373 metric tons of uranium ore in 1957.

KALISPELL, MONTANA—A five-year mineral exploration and geological mapping project in Flathead, Lake, and Lincoln counties has been started by Great Northern Railway Company, Pacific Power and Light Company, and the Montana Bureau of Mines and Geology. Goal is discovery and development of minerals to expand region's economy.

PARK CITY, UTAH—New Park Mining Company and the DMEA will finance a $715,185 exploration program for lead-silver-copper-zinc ore in New Park's Mayflower mine. The program will explore for deep ore in sedimentary rocks in the west section of the mine.

ONTONAGON, MICHIGAN—Bear Creek Mining Company has applied for State Conservation Commission leases and approval for copper mining in the western end of Porcupine Mountains State Park. Bear Creek is Kennecott Copper Corporation's exploration subsidiary.

ELLIOT LAKE, ONTARIO—Canada's first thorium recovery plant will be built here by Rio Tinto Dow Limited to recover byproduct thorium from Blind River uranium tailing.

GRANTS, NEW MEXICO—Phillips Petroleum Company has placed its new 1,725-ton-per-day uranium mill in operation to treat ores from its Ann Lee, Sandstone, and Cliffside mines in Ambrosia Lake.

ENTUBA, SOUTHERN RHODESIA—Discovery of uranium in faults and in certain beds within the Karroo sediments has started an extensive prospecting campaign east, west, and southeast of here.

MERRITT, BRITISH COLUMBIA—Underground exploration and development of Craigmont Mines Ltd's high-grade copper-iron discovery is to be carried out at a minimum cost of $500,000 by Canadian Exploration Limited, Noranda Mines Ltd., and Peerless Oil and Gas Inc.

PERTH, AUSTRALIA—Rio Tinto Ltd. has secured an exclusive prospecting reserve covering 13,000 square miles in the Yilgairn district for all minerals except gold and iron. Three known iron deposits in the reserve contain more than 100,000,000 tons.

SASKATOON, SASKATCHEWAN—Canada's first potash mine has cut the ore at 3,330 feet and found the character and quality equal to indications from drilling. Some production from the mine of Potash Company of America Ltd. is expected this year.

AUGUSTA, MAINE—Exploratory drilling for nickel-cobalt has been started by Roland F. Beers, Inc., as agent for Basic Inc. and associates. The DMEA has underwritten $75,000 of the project's cost.

Five-Year Exploration Program Set for Montana

A five-year program of geological mapping and mineral exploration is being undertaken in Flathead, Lake, and Lincoln counties, Montana by the Great Northern Railway and Pacific Power and Light Company, in cooperation with the Montana Bureau of Mines and Geology. The objective is location of minerals which can be developed by industry to expand the economy of communities served by the two companies.

The two firms are financing establishment of a bureau field office which has been opened in Kalispell. Geologists and mining engineers will work out of this office. Rock formations of the counties to be checked resemble those of the Coeur d'Alene district of Idaho and the Kimberley district of British Columbia. Prospecting of these areas in the past has been hampered by dense forests.

Supreme Court Knocks Out Gold Mine Damage Claims

The Supreme Court of the United States reversed the United States Court of Claims decision that domestic gold miners had been deprived of their property early in World War II by the WPB Limitation Order L-208.

Thus ended a long and valiant fight by six gold mining companies to force the government to accept claims for damages incurred by the companies for forced closing of the mines. Earlier the Court of Claims had ruled that the government was liable for damages which would then have to be fixed for each operation.

In making the decision, the Supreme Court through Mr. Justice Burton, ruled that:

"We do not find in the temporary restrictions here placed on the operation of gold mines, a taking of private property that would justify a departure from the trend of [earlier] decisions. The WPB here sought, by reasonable regulation, to conserve the limited supply of equipment used by the mines and it hoped that its order would divert available miners to more essential work. Both purposes were proper objectives; both matters were subject to regulation to the extent of the order. L-208 did not order any disposal of property or transfer of men. Accordingly, since the damage to the mine owners was incidental to the government's lawful regulation of matters reasonably deemed essential to the war effort the [Court of Claims] judgement is reversed."

Next Month—Your Preview of San Francisco Sept. Mining Show

DRILLING: Phillips Uses Airlegs in Big Drift at Ann Lee Mine

ORE DRIFTS generally stand better than waste drifts because the ore is harder, sandstone grains are cemented tighter, and the included oil makes ore more impervious to water. This big drift stands unsupported despite large water inflow.

Water Makes Mining Tough and Sloppy

By GEORGE O. ARGALL, JR.
Editor

Everybody in the mining world is still talking about Ambrosia Lake. That's only natural as this is the brightest spot in the mining industry—scene of the largest shaft sinking boom in recent domestic mining, and the heart of the largest uranium ore reserve.

Now the talk is of water, mining methods, drainage problems, ore supply for the mills, and back to water problems again. Actually it's not the water that's the problem in Ambrosia Lake's deep uranium mines; it's the slop, soup, or "cream of wheat" muck that forms every time broken ore and sandstone get together with water. This happens many times in the mining cycle. The water is always there, and will be until the district is drained. It oozes, spurts, drips, and seeps from all headings, so naturally everyone thinks of this as a water problem.

It's definite now that there is no uniform or homogeneous aquifier at Ambrosia. Even in one mine conditions vary from round to round. A heading will be dry, with only faintly moist walls, until a series of very thin fractures, many filled with mud, are cut; almost at once the fractures start flowing. A drain hole will cut a bed, flow water, and quickly dry up. Subsequent mining will show that there was only drainage a few 10s of inches from the hole with water-bearing sandstone undrained surrounding the hole.

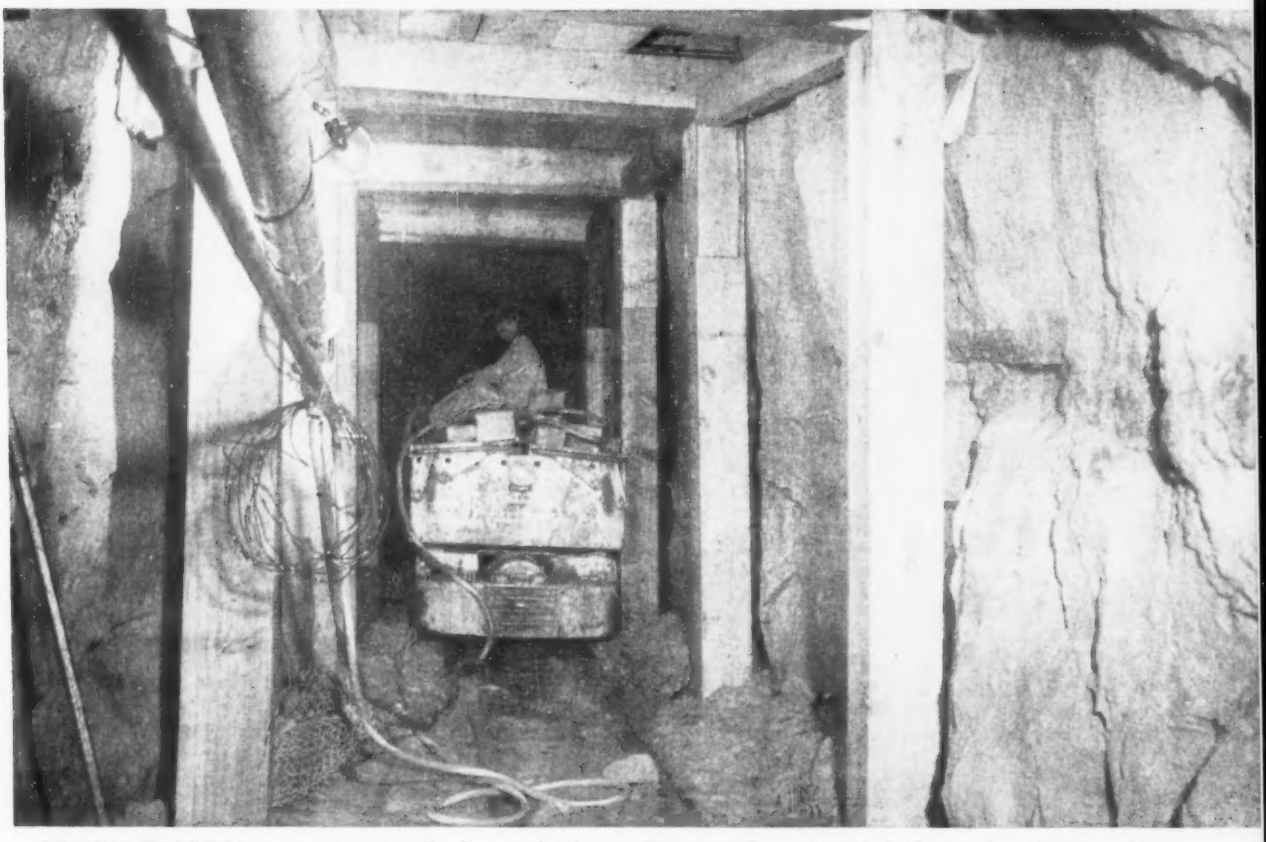
Water Makes Slop

To be sure, there is not much water by many base metal mine standards, but when it gets together with broken rock, watch out!

When the rock is blasted, the muck pile soon disintegrates or appears to dissolve. It will apparently drain if left for a time. Muck the pile into a car and it still may look dry. Bump the car several times with the mucker and motor and you immediately have what appears to be a car full of water. Push your arm into the car and you will find several inches of water underlain by a thick pulp. Haul the cars to the station and dump material into skip trenches. Allow it to drain and it will look like a pile of sand. Then slush it into skip and by the time the skip reaches the collar it looks like a load of water. Dump the skip directly into a truck and haul it to surface stockpile for further drainage.

Scores of engineers, thousands of men, and millions of dollars are working every day to solve the Ambrosia Lake problems. They are seeking answers and solutions to these key problems—and they will find them too.

TIMBER SETS: Ground Support at Homestake-Partners' Section 32



GROUND SUPPORT is necessary in many development headings in "wet mines". This sub level drift near the base of Poison Canyon sandstone is typical of ground conditions at Homestake-New Mexico Partners' Section 32 mine.

At Deep Ambrosia Lake U_3O_8 Mines

What is the best method for draining an area ahead of mining?
How long will it take for adequate drainage?
How wide will stopes stand without artificial support?
What is the best way to hold solid bottom in off-track mining?
Can a sharp clear separation of water and slime be made ahead of pumping? How can this be done?
What is the best method for mining multi-horizon ore without loss or dilution?
What is the best mining method for wet ground?
What is the best equipment to withstand abrasion?
The most important factor is that which is least attainable—TIME.

Due to urgency of uranium requirements, the necessity for having large mills to fill contracts, and the government's time schedule, Ambrosia has been another example of mill before mine.

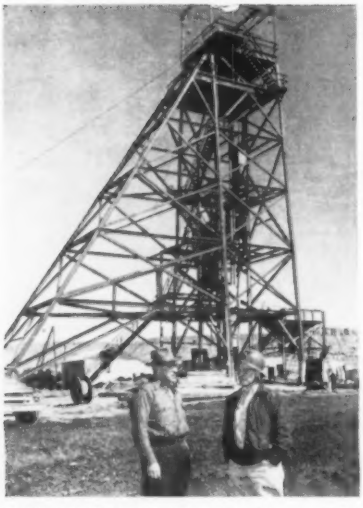
"Dry Mines" Produce First

Ambrosia Lake, North of Grants, New Mexico, contains the nation's largest uranium reserves—some 35,000,000 tons of 0.26 percent U_3O_8. And Ambrosia Lake now has the largest group of United States uranium mills: the 750-ton-per-day Homestake-New Mexico Partners' which went on stream in February; the 1,500-ton-per-day Homestake-Sapin Partners' mill which started in June; and the 1,725-ton Phillips Petroleum Company mill which began operations in late June. Kermac Nuclear Fuels Corporation is scheduled to have its 3,600-ton-per-day mill in operation at year's end.

These mills need ore and it will be many months before mine production can be brought up to mill capacity. Solving the wet ore problem is of paramount importance.

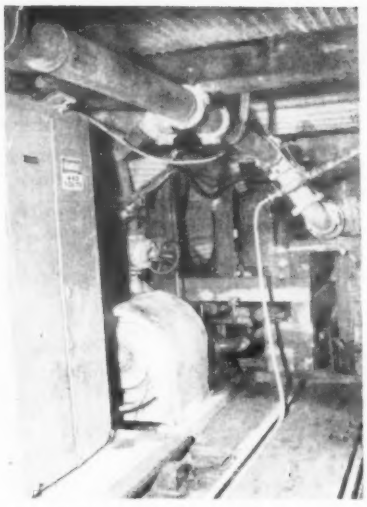
Well over 90 percent of all ore mined to date has been produced by the "dry mines"; largest of these is Rio de Oro Uranium Mines, Inc.'s Dysart where about 130,000 tons of ore in Section 11 have been mined for Homestake-Partners. Kermac Nuclear will have mining completed, 150,000 tons, at its Section 10 mine about the time its mill starts. Calumet and Hecla Inc's. Marquez mine in the southeastern part of the district has reached a mining rate of about 350 tons per day for shipment to Homestake.

Homestake Sapin's 595-foot-deep Section 15 between Rio's Dysart and Homestake Sapin 23 has been dry and off-track mining with Caterpillar 933 front end loaders and Getman trucks



PHILLIPS' ANN LEE headframe with general superintendent A. A. Ruoho (left) and mine superintendent, Ray Jenkins.

WATER PUMPED from Homestake-Sapin Partners' Section 25 mine flows away in ditch. Temporary headframe in background.



ELECTRIC PUMPS at main station of Homestake-New Mexico Partners' Section 32 mine handle water with ease. Pumps are in duplicate.

rapidly built up production of ore and development waste to 500 tons per day in early July from first production in late May.

Rare Metals Corporation of America's drilling indicated that its Section 29 mine southeast of the Marquez would be dry. However, in early July at a depth of 850 feet the shaft was making 190 gallons per minute in the Dakota sandstone. Water rings and a pump station are being cut. It is planned to catch all Dakota water and seal it off from the ore bearing Poison Canyon standstone. Foot wall development with rail haulage is planned.

All dry mining to date has been with Dieselized off-track equipment on both crawlers and rubber tires.

These "dry mines" have not presented any real mining problems.

What Is "Wet Mine?"

The "wet mines" are a different story. A "wet mine" has an inflow of 300 to 600 or more gallons per minute depending on amount of development. Homestake-Partners' Section 32 was the first in production. The 651-foot-deep shaft made only 90 gallons per minute. The first 4,000 feet of development increased this to 400—equivalent to 7.7 gallons per foot of advance, and less than was expected.

Homestake-Sapin completed its 835-foot-deep Section 23 shaft, finished skip pockets, and pump facilities, and was ready to start footwall development in early July. Water inflow has been in line with early estimates and dropped while cutting stations. It will, of course, inrease as development headings get underway. This confirms earlier drill holes pumping where one well with six-inch casing pumped 90 gallons per minute, and another with 10-inch casing made only 70 gallons. This will be Homestake's largest mine with an ore body estimated at 1,216,950 tons of 0.27 U_3O_8 ore.

Homestake-Sapin's Section 25 mine has been one of the wettest. Early drill hole tests pumped 210 gallons per minute through a 10-inch casing. The 815-foot-deep shaft was wet, over 400 gallons per minute, and bad ground slowed completion of station and pump sumps. Encouragingly, water inflow dropped before the drive to ore started in late June.

Diamond drill cores taken in these sections averaged 12 percent water with compressive strengths from 1,232 to 2,490 pounds per square inch. After drying to 1.14 percent water, one core had a strength of 2,725 pounds per square inch. Strength losses of wet cores compared to dried were 28 to 42 percent.

Phillips Petroleum Company found a heavy inflow of water at its Ann Lee mine in Section 28 which has slowed level development. Two new round concrete shafts have been started for hoisting and ventilation on sections 34 and 36. These will be the Standstone and Cliff Side mines.

Kermac Nuclear, which will be the largest operator, is developing its Section 22 mine on these levels because of multi-horizon ore. Its Section 30 shaft has been bottomed, to be followed shortly by Section 24. All have hit water. Kermac controls more than 15,000,000 tons of ore.

Wet mining is no cinch and there is a wide variety of opinions on how to develop and mine. Basically they reduce to two main concept: (1) off-track mining in the ore, and (2) sub-level waste development using rail haulage combined with slusher mining in ore horizon for ore delivery through transfer raises. Both have advantages and both have disadvantages. Off-track in ore cuts time and development cost. Sub level permits ore storage and blending by controlled drawing. Sub-level, at least theoretically, permits draining of ore beds by long holes and raises before mining. Off-track has disadvantage of higher openings for equipment and problem of maintaining haul roads. Sub-level has the disadvantage of extra ore handling and footwall dilution from scraping. Belt haulage is possible in both, but would probably be more favored in off-track stoping.

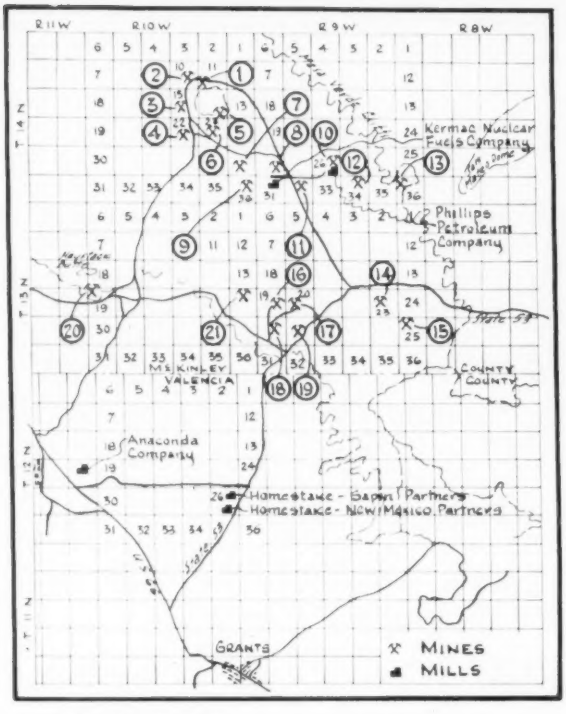
Drilling, be it Airleg, jumbo, electric rotary, rotary air, or hydraulic jet, would be applicable in both systems. All have been tried. Kermac and Phillips reportedly tested jet drilling with poor results. Phillips has tried a rotary electric.

Ground support from square sets to sand filling have all been discussed. So little stoping has been done that no best method has been found. Drifts have been roof bolted, caps bolted, and supported by conventional timber sets. Lagging has been light, where used, as heavy ground isn't a problem to date.

There has been a great deal of discussion about the use of undercutting machines as well as consideration of the use of a variety of continuous miners.

Loading in off-track mining has or

Location of Mines, Shafts, and Mills In Ambrosia Lake Uranium District



PRODUCING MINES

1. Dysart shaft, Rio De Oro Uranium Mines Inc.
2. Section 10, Kermac Nuclear Fuels Company
3. Section 15, Homestake-Sapin Partners
5. Holly Minerals Corporation
9. Section 36, Vanadium Corporation of America
10. Ann Lee mine, Phillips Petroleum Company
11. Section 32, Homestake—New Mexico Partners
14. Marquez mine, Calumet & Hecla, Inc.
16. Poison Canyon, Haystack Mountain Development Company
17. Mesa Top, Holly Minerals Corporation
18. Mid Continent Uranium Corporation
19. Westvaco Minerals Development Company
20. Section 19, Haystack Mountain Development Company

MINES UNDER DEVELOPMENT

4. Section 22, Kermac Nuclear Fuels
6. Section 23, Homestake-Sapin Partners
7. Section 25, Homestake-Sapin Partners
8. Section 30, Kermac Nuclear Fuels
15. Section 25, Rare Metals Corporation of America
21. Section 26,

SHAFTS BEING SUNK

12. Sandstone mine, Phillips Petroleum
13. Cliff Side mine, Phillips Petroleum

HOMESTAKE-SAPIN'S Section 15 mine development has been fast in dry ground. This photograph shows how back stands unsupported across 20-foot width at intersection of two development headings.

DRIEST MINE and first in production was Rio De Oro Uranium Mines, Inc.'s Dysart. Note how well the rock stands in this development heading. Ore body is high on Ambrosia Lake Dome.

will employ both tracked and rubber-tired front end loaders, slusher ramps, over shot loaders, and Joy loaders. Mechanical mucking into cars at bottom of transfer raises is gaining in favor.

Sand filling is almost certain to gain in importance—especially when mining pillars. Both Kermac and Phillips mills are well located to supply sand fill directly to mines.

The "wet mines" all have common problems. Some of these are: materials handling, abrasiveness of ore and slime-sand filled water, and transfer of uranium from ore to water. Materials handling is tough. You can't build a chute from which muck will flow fast and free under complete control. It flows too fast when saturated, and when drained a little it just hangs up. There's a problem in loading the skips and a bigger problem in emptying them cleanly. It's even a problem to dump the muck out of the mine cars and haulage trucks on surface. In the winter the ore freezes on the surface. Bins and truck bodies must be insulated, heated, or anti-freeze treated. And then when you get the ore to the mill it has to be dried for sampling and processing through normal circuits. Phillips is going to use a drier in its mill.

Mine water, actually water plus sand and slime, is exceedingly abrasive. It cuts the guts right out of high-speed centrifugal pumps. Numerous decantation and settling devices are used underground to get as clean water as possible, yet keep the sand and silt out of the sump. Continuous bucket elevators have been considered for sump cleaning. A series of tanks ahead of relay pumps in the shaft are also used to trap sand and prolong pump life.

Soft bottom has been a problem. Loading equipment in particular has settled, high centered, and bogged down. There has been little trouble in maintaining track, however. The bottom of the ore undulates, so there will always be some down-dip mining. This means pools of water to aggrevate the mining difficulties.

And there is the concentration of uranium values in the mud and silt pumped from the mines. This very fine material, not surprising, seemingly has a high uranium concentration, so settling ponds must be provided to free it from the water.

Continued on page 83

BUCYRUS ERIE shovel loads black manganese ore at Serra do Navio deposit. Mine is developed by 25-foot benches. A trader once used ore for canoe ballast, and later had ballast analyzed. It was found to contain high-grade manganese.

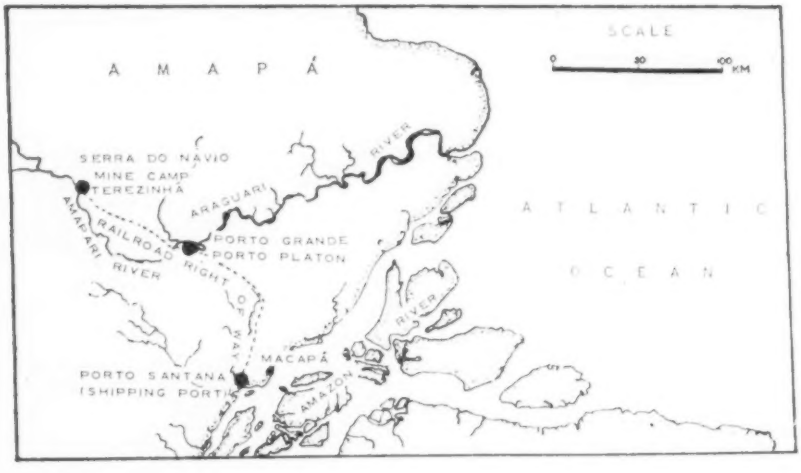
CRUSHING AND WASHING plant upgrades ore. The product blended for shipment contains approximately 46 percent

Big Brazilian Manganese Project Hits

A huge project to develop one of the few known high-grade sources of manganese was completed last year by Industria e Comércio de Minérios, S.A. (ICOMI) in the Brazilian territory of Amapa. Now one of the world's largest producers, ICOMI shipped 600,000 tons of metallurgical grade ore to markets around the globe in 1957. This is the rated annual output of open pit and plant facilities, but production can be stepped-up to 1,000,000 tons yearly with the addition of more equipment.

It took nearly 11 years and a development cost of $50,000,000 to bring the manganese deposits in the Serra do Navio District into production. The construction project alone spanned a 3 year period dating from its start in 1954. The mine and crushing, washing and screening installations were carved out of thick, jungle-covered terrain, nearly 280 airline miles northwest of Belem on the south bank of the Amazon River near its mouth. Docking facilities for ocean going ore carriers had to be built on the north bank of the Amazon River, 13 miles upstream from Macapa. A conveyor system for stockpiling and loading ships had to be provided. A 122-mile-long, standard gauge railroad had to be slashed northwest through the jungle from the port to the mine site near the Amapari River. Funds for the development were provided by the Export-Import Bank.

Today, ICOMI boasts the only railroad north of the Amazon River. Last year it shipped more manganese ore than any other producer in the world.



The Ore

The deposits are located in typically tropical country with a slightly hilly topography. The region has a heavy rainfall which produces a humid, but not uncomfortably hot climate.

About 20 separate ore bodies are known to exist in the area. They are distributed along a belt having a northwest-southeast trend and roughly parallel the course of the Amapari River. The belt is about 5 miles long and is up to 2000 feet wide. At the northwestern end the ore bodies are found on the west side of the river, although the predominant tonnage of ore lies on the east side. The largest known ore body is about 1,500 feet long, and the longest extent of closely connected ore bodies is about 3,500 feet.

The ore consists primarily of the mineral cryptomelane with some manganite present in many locations. The ore bodies are of irregular surface contour. The outcrops generally occupy the crests of hills, and they vary in size, prominence and spacing. The size of outcrops offers little or no clue to the quantity of the ore

manganese. A village will be built at the mine and will include school, hospital, club, church, theatre and shopping center.

MARSHALLING YARD was cleared from jungle. Trains are made up of thirty, 70-ton cars for the 122 mile trip to the harbor. Cars are loaded at rate of 1 minute each, and are dumped two at a time into hopper at the port.

Peak Output

STOCKPILES at the harbor provide surge capacity for the operation. The ore is stored in 630-foot long stockpiles by a stacker; it is reclaimed by Marion 6-yard shovels. Conveyor bridge at ship is floating type permitting movement with tide.

underground or the extent of its depth. In places an ore body is virtually hidden beneath its overburden of a few feet of rubble, clay, and soil. The deepest ores extend to a depth of about 150 feet below the surface. Immediately below the ore and bordering it there is usually a mud-like weathered schist. The change from high-grade ore to underlying waste is gradual in a few places, but is usually sharply defined.

Float ore, in sizes from pebbles to huge blocks, and heterogeneously mixed with clay and soil, overlies and flanks the various ore bodies. In places, float extends for several hundred feet away from the parent ore body.

The ore averages about 46 percent manganese. Iron, silica, alumina and alkalies in the ore are low and offer no problems in its use. Structurally, the typical ore is fairly dense and compact, but it shows all stages of variations from dense and massive to porous, friable material.

Exploration and Mining

Geological exploration by drilling amounted to 195 diamond drill holes totaling more than 33,000 linear feet in aggregate depth. In addition to drilling, exploration work included routine topographic and geologic mapping, test pitting and shallow trenching, and widespread scouting. Exploration results showed the existence of at least 16,000,000 tons of ore containing in excess of 46 percent manganese. Intensive drilling activity has covered less than 65 percent of the area of the known ore zone. This has led to an estimate that the whole deposit would probably contain at least 30,000,000 tons of mineable ore. Typical analyses of the ore are shown in table below.

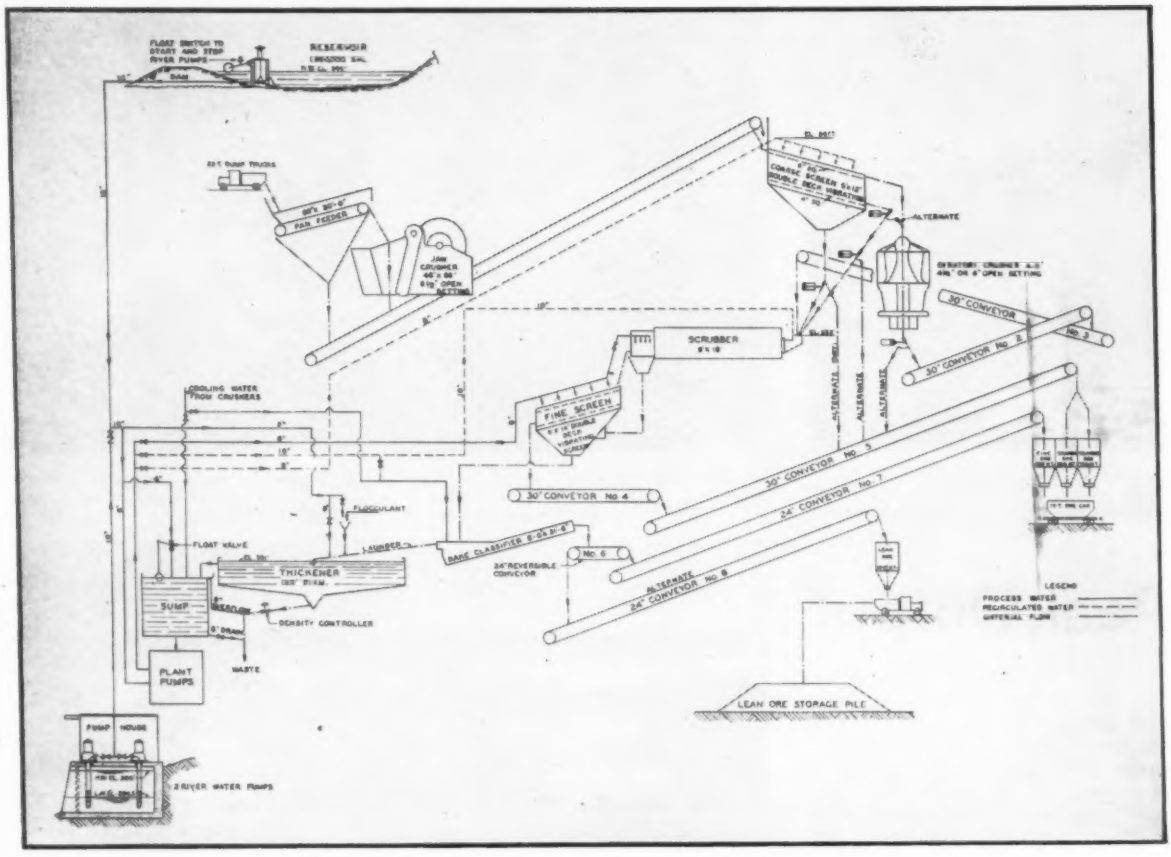
Two of the most southerly ore bodies, designated as T-4 and T-6, are being worked at present. After stripping the overburden, which varies considerably in depth and character, the ore is mined in 25-ft benches by standard open-pit methods. All known ore is equally accessible. Pneumatic wagon drills and jack hammers with tungsten-carbide insert detachable bits are used in drilling. Compressed air for the drills is supplied by portable compressors. Blasting is done by conventional methods.

	Mn	*Fe*	SiO_2	Al_2O_3
Ore, blended for export	46.8	3.2	3.6	10.6
High-grade ore	57.5	1.6	0.5	2.8
Low-grade ore	33.9	9.3	7.9	13.8

Beneficiation

The broken ore is loaded into 22-ton, Diesel-driven rear-dump trucks by three Diesel-operated shovels equipped with 2-yard dippers. The loaded ore is then trucked 1½ to 2 miles over good roads to the primary

Flowsheet of ICOMI crushing, washing and screening plant.



crusher where it is dumped into a 40-ton hopper. It is delivered by pan feeder to a 48- by 66-inch Blake-type jaw crusher powered by a 300-horsepower motor through V-belt drive. With a 6½-inch setting at the open side, the crusher has a capacity of 450 tons per hour.

The jaw crusher discharges onto a 42-inch belt conveyor which carries the ore a distance of about 130 feet to the secondary crushing plant. Here it is first fed to the coarse screen, a 5- by 12-foot double-deck vibrating screen with 6-inch square openings on the top deck and 4-inch square openings on the bottom deck. High pressure water spray removes clay and rubble from the ore on the screens.

Oversize from the top deck is fed by chute from the screen into the secondary crusher, a 4-foot gyratory of 135-tons-per-hour capacity, powered by a 200-horsepower motor. The crusher is normally set at 4¼ to 5 inches.

The discharge from the secondary crusher is delivered by a 30-inch belt conveyor directly to either of two 550-ton coarse-ore loading bins, or it may be diverted and conveyed to a 9- by 18-foot revolving scrubber.

Material remaining on the bottom screen (minus-6 plus-4 inch size) as well as that passing through this screen (minus 4-inch) may likewise go either to the coarse-ore bins or to the scrubber. The system of belt conveyors permits such transfers as the operating conditions and the grade of the ore may demand.

In the revolving scrubber the ore is given a thorough water wash to remove all remaining clay and dirt. The discharge from the scrubber passes over a dewatering screen with 3/16-inch round openings. De-watered oversize reports to the fine screen, a 6- by 14-foot doubledeck vibrating water-sprayed screen with 1½-inch square holes on the upper deck and a 4-mesh bottom deck. This double-deck screen is used only for the purpose of increasing the screening efficiency and not for separation, as the material over both decks is discharged to the same 30-inch belt conveyor and carried to the coarse-ore bins. The discharge through the bottom deck, combined with the undersize from the dewatering screen, is treated in an 8- by 31½-foot rake classifier.

Depending upon the manganese content, the minus-4 mesh classifier sands are delivered by belt conveyor to a 500-ton fine-ore bin or to a 100-ton lean-ore bin.

Overflow from the rake classifier is laundered by gravity to a 100-foot thickener. The fines settling in the thickener are disposed as waste. The overflow is discharged to a sump and used over again in the process.

Water for the plant is pumped from the Amapari River through a 10-inch pipe line to a 1,900,000-gallon reservoir. A float switch in the reservoir starts and stops the two, 1,200-gallon-per-minute pumps at the river station to keep the reservoir at constant level. About 1,200-gallons-per-minute of make-up water is required in the process.

The Railroad

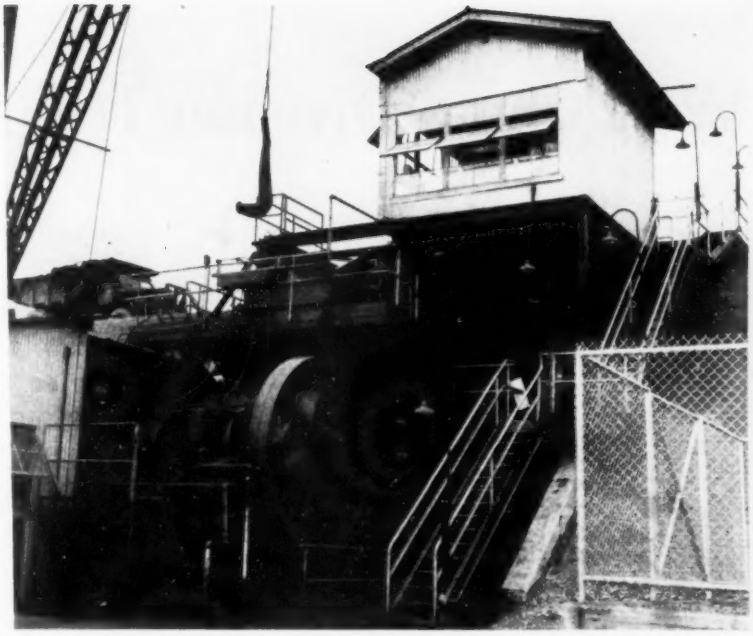
Ore is drawn from the bottom of the ore bins through air-cylinder operated gates into railroad cars on a single loading track under the bins. A 70-ton car can be loaded in about one minute.

The railroad is a single-track system with passing tracks at approxi-

mately 17-mile intervals. Rails are 90 pounds and ties are hand hewn from local hard woods of the delta region between Macapá and Belém. Ballast material was obtained by washing laterite gravel from soil at selected sites along the railroad. Through jungle areas the right-of-way was cleared 200 feet in width in order to eliminate danger from falling trees.

The railroad measures 122 miles in length, or 128 miles including switch yards and sidings. Maximum grade towards the oprt is 0.35 percent, towards the mine 1.50 percent. The altitude of the mine terminal is 390 feet; elevation at the port is 26.5 feet. Five bridges, with spans ranging from 119 to 720 feet, and two 36-foot underpasses were built. Rolling stock includes three, 1,200-horsepower Diesel-electric locomotives, eighty 70-ton ore cars, and some 30 miscellaneous freight and passenger cars.

The locomotives are equipped for voice radio communication and train control is maintained by voice and code radio between fixed stations at the terminals and at the midpoint, Porto Platon.



PRIMARY BREAKER is a 450 ton-per-hour jaw crusher. It is the first of the two crushing stages at the beneficiating plant. Entire project required about $50,000,000 for development and was under construction for nearly 3 years.

Harbor Facilities

The railroad terminal, harbor installations and related facilities are located on a 320-acre tract on the north shore of the north channel of the Amazon estuary, about 13 miles upstream from the City of Macapá. The north channel has deep water close to shore at the port site.

Ground borings, however, revealed a shore line consisting of soft organic mud in the greater part of the port area. The only exception was a hard ridge which extends out to the river bank at the east boundary. Here it was found practicable to build a service pier with concrete deck on steel H-piling, equipped with a 50-ton derrick for handling general cargo. This pier is 270 feet long and 55 feet wide. Minimum depth outside the pier is 33 feet. All of the heavy equipment, including locomotives, cars and rails was unloaded at this dock.

The remaining waterfront area available for the ore-loading structure consisted of a tidal mud flat from which the underwater profile sloped steeply to a channel depth of 175 feet. At the fender line where ore carriers tie-up, the mud was 125 feet deep, making the area unsuitable for any conventional type of piled dock structure. It was therefore necessary to adopt a floating-type dock. Abutments and anchor structures for this dock were placed far inland on hard, stable foundations, secure from erosion and effects of slides in the soft muds of the river bank.

Ship Loading

Railroad cars, bearing 20-mesh to 6-inch lump, washed manganese ore, are dumped two at a time into a hopper at the harbor terminal. From the hopper, the ore is fed by two reciprocating pan feeders to a 36-inch belt conveyor, which in turn delivers the material to a second 36-inch conveyor. The second conveyor serves both for loading the ore into vessels at the dock and for stockpiling the ore.

When loading vessels, No. 2 conveyor discharges ore to a third conveyor with a retractable loading tower, supported on a 300-foot cantilever bridge. A self-propelled retractable loading tower with a boom that can be raised or lowered travels on top of the conveyor bridge and delivers the ore into the ship's hold. Modern ore carriers ranging in size up to 26,000 tons can be accommodated at the dock.

The conveyor bridge rests on a concrete abutment 300 feet inshore from the fender line of the dock. The support on the shore end consists of a system of pins and sliding members which permits vertical movement with the tides but anchors the bridge placement.

The outboard end of the bridge rests on 24 pontoons, each 20 feet long, 8½ feet wide, and 5½ feet deep, arranged in four watertight compartments. Individual pontoons may be removed for maintenance by flooding two compartments and floating the pontoon free and re-installed without interfering with the operation of the dock. Heavy steel cables from the conveyor bridge to inshore concrete anchors hold the structure in place. A set of auxiliary chain anchorages has been installed as an extra safety measure.

For stockpiling, conveyor No. 2 is equipped with a self-propelled traveling stacker with a swinging and lowering boom which places the ore into 630-foot long stockpiles on either side of the conveyor at a rate of 1,200 tons-per-hour. Rated capacity of the stockpile field is 120,000 tons; maximum emergency capacity is 170,000 tons.

Ore from the stockpile is reclaimed by two 6-yard electric shovels. These load into two self-propelling hoppers with reciprocating feeders which deliver the ore to the conveyor for loading. Reclamation and loading capacity is 2000 tons-per-hour.

From the port the ore carriers transport the metallurgical grade ore to world markets. The ships travel through channels at the mouth of the Amazon to the south bank at Belem and then put to sea. Navigational aids are now being installed along the north channel to shorten the route to the sea lanes.

THE END

Roadbinder

Why Chino Division Treats Mine Roads

Dust Wakes Drastically Reduced ▶

◀ Surfaces Are Smooth, Strong

◀ Less Maintenance Required

Cuts Number of Sprinkling Shifts ▶

How much is road dust and road maintenance costing you? Engineering studies at Chino Mines Division, Kennecott Copper Corporation, Hurley, New Mexico, were undertaken to reduce this high cost. The studies indicate that up to 550 water sprinkling shifts can be eliminated per year at the Santa Rita open pit mine by treating roads with lignin sulfonate. Lignin sulfonate is a water-soluble roadbinder which can be sprinkled with conventional equipment. It binds dust to the road and forms a hard, rock-like surface on setting. Dust conditions following use of this material have been drastically reduced, perhaps as much as 80 to 90 percent.

Another feature highlighted by this study is that the use of lignin sulfonate on the pit roads may effect a saving of 11,000,000 gallons of water per year. Water costs are high so a material savings results from reduced water consumption. Water is a precious commodity in the Southwest.

Another indicated advantage is that mine roads treated with a roadbinder, such as lignin sulfonate, are easier to maintain. Blading, grading, and surfacing for up-keep are reduced. If roads are kept in better condition it follows that vehicle maintenance and tire wear will be reduced. Safety is improved because visibility is better.

The industrial engineering study indicates that about ten miles of mine road can be treated with the roadbinder for 13 percent less than the cost required to treat five miles of road by water sprinkling.

Copper ore is mined at the Santa Rita open pit mine and haulage of ore and waste is done by a combined rail and heavy rear-dump truck system. On the upper levels trucks are used with shovels for pioneering work. In constructing the bottom levels, trucks haul ore and waste to rail loading points. In the middle levels, haulage is generally, but not always, by rail. Approximately 22,000 tons of ore is mined per day, and about twice this amount of waste is handled for a total of 66,000 tons of combined ore and waste. Trucks now used for haulage are in the 25-ton capacity class. Of

course roads exist other than those used by the rear-dump trucks. There are two access roads to the open pit and bench roads for service vehicles. It has been estimated that presently approximately 7 to 10 miles of mine roads should undergo lignin sulfonate treatment. Certain roads which are only temporary in nature are not treated with the roadbinder but are occasionally treated by conventional water sprinkling methods in order to control the dust condition. Operations at the mine are on a 3-shift, 7-days per week basis.

How Roads Were Treated

At the Santa Rita open pit, two full time water trucks were employed to sprinkle water on the roads. Each of these trucks had a 1500-gallon tank. In addition another truck with a 670-gallon tank was available for use. One of the 1500-gallon capacity trucks was also used to water the drills on the day and afternoon shifts. On the graveyard shift it was used to sprinkle the pit roads. The 670-gallon truck was used only occasionally for sprinkling water on the roads.

Approximately 22,000,000 gallons of water was sprinkled on the roads for dust control each year. Total average mileage of road that received treatment amounted to about five miles. Roads over which 25-ton haulage trucks traveled were sprinkled heavily but still remained slightly dusty. Other pit roads also remained dusty. Results while using water on the roads were only temporary and even at best unsatisfactory. Water on the road usually had little effect one hour after it was applied, and two hours after it was applied its effect was negligible. During winter months there was an additional hazard of water freezing on sprinkled roads. The possibility of vehicles skidding on loose gravel was always present to some degree. Past experience showed that sprinkled roads tended to rut and pit quickly. Due to this condition the roads had to be graded frequently.

When the industrial engineering department undertook the lignin sulfonate study, short sections of various types of roads were sprinkled. Different methods were used in preparation of the roads and the roadbinder solution. Records were kept of the condition of the test roads before sprinkling and at various dates afterward.

Effect on Flotation

One of the biggest deterents to more extensive use of lignin sulfonate is the flotation interference characteristics of this product on some types of ore. The research metallurgists conducted considerable test work on the effect of lignin sulfonate on Chino ores. It was found that lignin sulfonate even in amounts up to 0.1 pound per ton of ore had little effect on flotation of copper. There was a slight increase in copper recovery along with a slight decrease in grade of concentrate when this amount of lignin sulfonate was added to the ore. Steaming apparently destroys any effect the lignin sulfonate may have on molybdenum flotation.

COST OF ROADBINDER fob Wisconsin is $0.045 per gallon; freight to Santa Rita is about $0.15 per gallon. Anticipated consumption per mile per year is 8,000 gallons or $0.2976 per linear foot of road averaging 20 feet in width per year.

What is Lignin Sulfonate

In sulfite pulping for manufacture of paper, the mill retains the wood fiber and dissolves away the cementing material. The final solution of cementing materials (sugars, lignosulfonic acids and resins) is the byproduct which is generally termed sulfite roadbinder. An available supply of the material exists because it is estimated that 113 sulphite pulp mills in the United States and Canada will produce over 30,000,000 gallons of 10 percent lignin sulfonate per day. Chino Mines Division obtains the roadbinder in 8,000-gallon railroad tank cars containing a viscous, 50 percent solution of lignin sulfonate. Lignin sulfonate is available in more concentrated solutions, however there is a sharp change in viscosity above 50 percent which makes it extremely difficult to handle.

The exact mechanics of the action of a roadbinder product are quite complex. Essentially it promotes binding of the solid soil particles together. Properly applied, lignin sulfonate makes a hard, firmly-bound surface that aids traction, for vehicles. Lignin sulfonate, applied as a 10 percent water solution, cements the road surface as it dries into a hard, rock-like substance.

The roadbinder seals the top surface against the action of weather. The surface when somewhat moist is slightly plastic and therefore traffic aids in compaction of the material. Following a rain a treated road again becomes slightly plastic, but grading will help restore the surface to the original condition upon drying. This "self-healing" characteristic of lignin sulfonate treated roads is quite important and contributes to a longer road life. When a treated road, after wear and tear, is broken, or if broken by lugged traffic, a very light application of the roadbinder to the surface results in the formation of a fresh cementing bond.

How Lignin Sulfonate is Applied

For best mixing, the sticky 50 per-

This article was adapted from an actual industrial engineering report by Don Cummings at Kennecott Copper Corporation's Chino Mines Division. Division management had suggested that something be found to allay dust on company roads. Many roadbinders were tested by the metallurgical department in the research laboratory and lignin sulfonate was recommended for field testing. In 1956, Dan Thorne, maintenance and construction engineer, requested an industrial engineering study regarding application of lignin sulfonate. The request was approved by Mr. G. J. Ballmer, superintendent of mines. The methods developed are now being applied at the open pit at Santa Rita. The article illustrates the results obtained by a typical industrial engineering study.

cent solution should be added to a truck tank filled with the proper amount of water. Enough 50 percent solution is added to produce a 10 percent lignin sulfonate solution. For proper proportioning of the roadbinder material, a calibrated dip stick can be inserted through the hatch of the truck tank to determine the amount of ingredients added. It is recommended that the roadbinder be added to water as the material has a tendency to stick to the bottom and sides of an empty truck, and poor mixing results. But if added to water no difficulty is encountered in obtaining a homogenous solution. Water trucks at Chino are equipped with circulating pumps which mix the solution.

The road to be sprinkled must be suitably prepared. At Chino the following procedure gave good results, if the road was dry enough to soak up moisture. The road surface should be loosened to a depth sufficient to cut out all the washboards and chuck holes, and then smoothed. The surface should be loosened to a depth of approximately 1-inch which represents the depth of desired penetration of roadbinder. The road should be formed in such a way that it will readily drain, either by crowning at the center or by sloping to one side on curves. This requirement is important because standing water or lignin sulfonate solution can increase plasticity of the road material to a point where traffic can cause pot holes to develop. If it is necessary to soften the road surface, sprinkle on a light application of lignin sulfonate before the first grading. Loose gravel should be bladed off the road completely. The desired crust formation breaks if there is loose gravel on the road surface. Blade most of the loose road surface material into windrows on each side of the road to prevent run-off of lignin sulfonate during application. This also helps to insure uniform penetration of lignin sulfonate into the sub-surface.

Spray one-third to one-half of the total 10 percent lignin sulfonate solution for treatment between the windrows. Vary the speed of the truck to control the rate of application. The sprinklers on the 1500-gallon capacity trucks at Chino empty the tanks in about four minutes. The rate of flow, however, is not adjustable. Apply the maximum amount of solution that does not cause run-off or formation of puddles. Thinner applications take more time and have no advantage.

Following this initial treatment with the roadbinder, blade the windrows to the center of the road, taking care to spread the material evenly. Then follow with another sprinkling of lignin sulfonate (about a third of the total solution to be used on the road). After the second application, the road should be bladed to a smooth surface. A final top dressing of lignin sulfonate should be added to finish-off dry spots which might have occurred during grading. This finishing-sprinkle should be a light coat in order to avoid excess surface plasticity and run-off of solution. Care should be taken to moisten all dry spots otherwise the resulting crust which forms may not stand up. The road should then be compacted by letting traffic pass over it. Compaction should be done before the roadbinder dries and while the surface is still plastic.

The lignon sulfonate roadbinder, being water soluble, should have sufficient time to set and dry before rain to prevent rapid leaching of the binder. If a rain storm comes up immediately after application is made, any binder which is still in a moist condition on the road surface is flushed off. Once the surface crust has set, leaching action of rain and snow run-off is slow. These weather elements, however, in time will wash off the top lignin sulfonate and leave the road slightly dusty. A very light sprinkling with the solution, however, will bring the road back to a well-surfaced condition.

Consumption

Based on actual test work conducted by the industrial engineering department at Chino, consumption of the roadbinder product to maintain 10 miles of road would be about 80,000 gallons of 50 percent solution annually. This is yearly consumption of about 8,000 gallons per linear mile of road. The condition of the road prior to treatment has quite an effect on the amount of roadbinder necessary to produce a good crust. For instance, hard, compacted untreated roads offer more resistance to penetration of the roadbinder. A loosely consolidated surface makes penetration easier. Compacted roads should be bladed to loosen the surface, otherwise lack of penetration of the sprinkled roadbinder will cause a resultant decrease in the life of the treated road.

Under dry conditions with no crawler mounted traffic traveling on the treated road, a carefully prepared

Before: Broken crust in surface of road treated with lignin sulfonate was caused by lugs of a large bulldozer. This is by far the worst abuse given a mine road, but condition of surface can be remedied.

After: A close-up view of the same road surface shows the result obtained by sprinkling the broken crust with lignin sulfonate and allowing rubber-tired vehicular traffic to compact the road.

Steps in Sprinkling Lignin Sulfonate on Prepared Roads

1. WATER (left) is added to 1,500-gallon tank on truck; amount introduced is 1,160 gallons and is determined by measuring stick. Time required—about 4 minutes.

2. LIGNIN SULFONATE (right) is then added to tank already containing water; amount of roadbinder added is 280 gallons of 50 percent solution.

3. SPRINKLE (left) solution on roads. Truck's 100 gpm pump mixed the contents of tank while roadbinder was being added and while enroute to sprinkling site.

4. BLADE (right) windrows to center of road after it has been prepared and the roadbinder applied. Add a light top dressing to touch-up dry spots.

road could last two months without resprinkling. Lugs on bull-dozers and shovels, however, will tear up the crust quite rapidly. Rain and snow pose minor problems which have already been mentioned. The roads over which heavy-duty haulage trucks are traveling are put to a severe test. These roads must be carefully prepared to receive the lignin sulfonate treatment.

Summarizing, the effect of lignin sulfonate could result in:

1. A total saving of 550 water sprinkling shifts per year due to greater life of treated roads in controlling dust.
2. Approximately 80 to 100 percent reduction of dust due to traveling vehicles.
3. A 50 percent reduction in grading time required to maintain mine roads.
4. Reduced vehicle maintenance and tire wear.
5. Greatly improved safety due to better driver visibility and reduced skidding hazard.
6. A 11,000,000 gallon per year saving in water for roads.

THE END

Eagle Mill

By F. J. WITTHAUER

Improved copper recovery in the lead concentrate, increased slimed-lead recovery, grinding of the zinc-lead-copper ore in an alkaline circuit, and use of flowrators are the latest improvements at the Eagle differential flotation mill of the New Jersey Zinc Company. These and other flowsheets changes at this unique underground flotation mill are detailed in this article.

The Eagle mine and mill of the Empire Zinc Division, The New Jersey Zinc Company, are located at Gilman, Eagle County, Colorado. This property, for many years, has been the leading producer of zinc in Colorado. It has ranked high among producers of lead and copper and precious metals also.

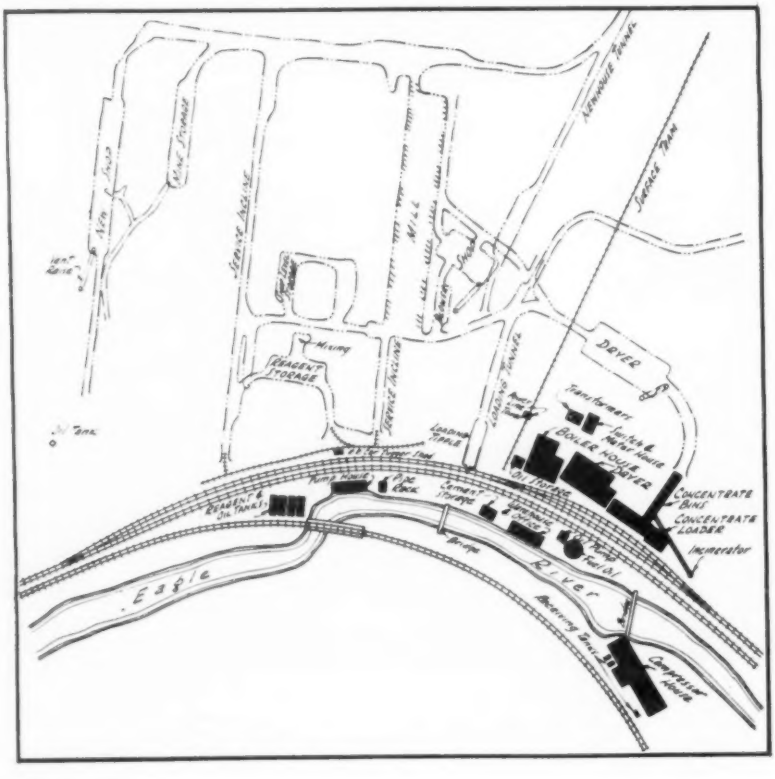
Beginning in 1946, a program of modernization in the mill was begun. Two of the rod mills were replaced by ball mills, to provide two-stage grinding. The air-lift cells were replaced by mechanical cells in both flotation circuits. By these means, the capacity of the mill was increased from 600 to 1,200 tons per day. Some reagents were changed also. Lime replaced soda ash to regulate the pH in both sections, and amyl xanthate replaced Aerofloat.

In 1954, when important amounts of copper began to appear in the mill feed, the reagents were modified to attempt to recover some of it. Sodium sulfite was added in the lead section, and the pH was reduced from the range 9 to 10 to 7 to 7.5.

In 1956, a separate slime flotation step was eliminated. The washing classifier was used to remove wood chips only, the overflow being used as make-up water in the grinding mills.

Flowrators are used for controlling grinding circuit water, copper sulphate, and cyanide solution feeding.

EAGLE FLOTATION MILL is underground in the side of Battle Mountain in the left foreground. See the site drawing for location of the mill and auxiliary facilities. Narrow steep and deep canyon with two railroad tracks running along side Eagle River made it necessary to build mill underground. Tailing is pumped down the canyon several miles to ponds where canyon widens. All ore is mined deep in Battle Mountain to left in photograph.



Why Mill Underground

The accompanying photograph shows how the narrow bottom of the Eagle River Canyon adjacent to the mine is almost completely filled by two railroad tracks. An underground mill was determined to be the most economically feasible when the mill was planned and built in the late 1920's. Two crosscut adits from the Canyon walls already had been driven into Battle Mountain to reach the ore-bear-

Mr. Witthauer is Eagle mill foreman of the Empire Zinc Division of New Jersey Zinc Company at Gilman, Colorado.

Recovers More Metal From Complex Ore

ing beds. The upper, known as the Newhouse Tunnel, is about 115 feet above the railroad. See line drawing of mill site and supporting installations. This tunnel connects with the 16 level of the mine. It is the main haulage way. The other tunnel, known as the Loading Tunnel, is about 27 feet above the railroad. It is parallel to the Newhouse, the center lines being 47 feet apart. The tunnels are joined by three ore pockets, used for storage of the copper-silver ore. This ore is dumped from mine cars in the Newhouse into the pockets, then pulled through chutes into a larry car, trammed through the loading tunnel to a tipple, and dumped into railroad gondolas.

A crosscut about 460 feet from the Newhouse portal was driven west 258 feet and expanded to a room. A drift connects this room with the main mill room. The floor of this room is the top of the coarse-ore storage pocket, which extends down to the Loading Tunnel level, where the crushing plant excavation was made.

The main mill room is 332 feet long, 52 feet wide, and 22 to 56 feet high. It lies on an incline between the Newhouse level and a drift on the Loading Tunnel level. A 10-foot section along the west edge of the room is used for an 18° service incline, which runs on down to the loading dock at the railroad siding.

Other rooms on the Loading Tunnel level, all interconnected with drifts, are a 50 by 116-foot drying plant, an 80 by 40-foot shop, a 45 by 60-foot room originally used for blowers and now for a hydraulic press and the crushing plant.

Later, the crosscut from the Newhouse Tunnel was extended. Another storage room and another shop were excavated, and another incline to the loading dock was sunk. A drift to join the new incline and mill service incline and two more storage rooms on the Loading Tunnel level were made at the same time. A room for storing and mixing reagents was excavated at the loading dock level. This room has one opening to the dock and another to the new incline, and is joined to the Loading Tunnel level drift by a short raise. The new incline station at the loading dock level was enlarged to permit more reagent storage. The total rock excavation over the years has amounted to about 600,000 cubic yards. The excavation before 1940 was done by the E. J. Longyear Company. Later work was done by the Eagle mine crews. The walls of nearly all the rooms and many of the drifts have been gunited. There is very little water seepage.

Milling Methods

When the mill was placed in operation in the late 1920's, it utilized gravity methods as well as flotation. The ore was washed in a drag classifier for removal of wood chips, soluble salts, and slimes, and then ground in a screening ball mill to minus-$^{3}/_{16}$-inch size. The mill discharge was classified, the coarse material being treated in a jig and the fine being tabled to produce lead concentrates. The gravity tailings were ground in four, 4 by 10-foot rod mills, each in closed circuit with a 54-inch Akins classifier.

Classifier overflows were thickened from 20 to 40 percent solids in two thickeners. The lead section consisted of two rows of Forester air-lift roughers and three Forester cleaners. Reagents used were caustic soda, soda ash, sodium silicate, hardwood creosote, fuel oil, and pine oil. Lead tailing was thickened in two more thickeners and fed to four Forester zinc roughers. Rough concentrate was split and cleaned in two sets of three Forester cleaners each. Reagents used were copper sulfate, soda ash, lime, sodium silicate, pine oil, and fuel oil.

The mill was shut down in 1932 because of the depressed zinc market. With improved economic conditions, zinc production was resumed in May 1941. Before the mill was started, several modifications were made in the flowsheet. A Dorr double-deck classifier was installed to wash the ore, replacing the drag classifier and several thickeners. The classifier overflow was treated in a separate flotation circuit, producing a final tailing and a bulk concentrate which was added to the lead section feed. The grind was made coarser, eliminating the thickeners ahead of flotation. The reagents were changed. In the lead section, soda ash, cyanide, Aerofloat 25, and pine oil, and in the zinc section, copper sulfate, soda ash, Aerofloat 25, and pine oil were used.

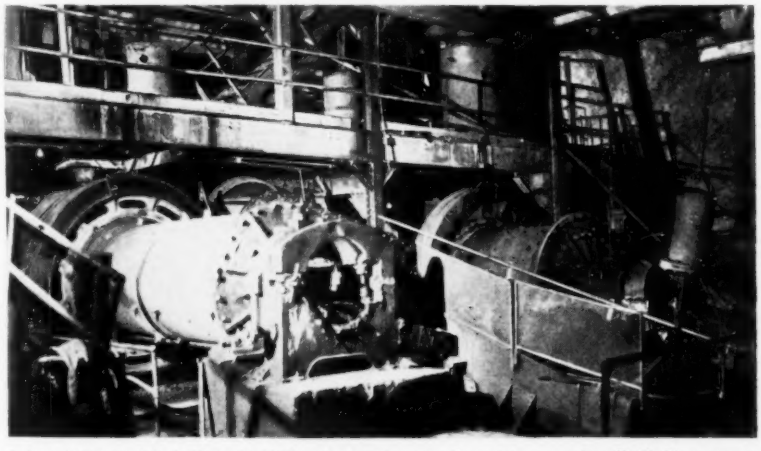
In 1942 and 1943, a new drying plant was built outside the mill between the canyon wall and railroad.

Metallurgical Data

The mill feed presently averages about 11 percent zinc, 2 percent lead, 0.5 percent copper, and 3 ounces of silver per ton. The lead concentrate averages about 55 percent lead, 5 percent zinc, 5 percent copper, and 35 ounces of silver per ton. Recovery of lead is about 85 percent, of copper about 35 percent, and of silver about 45 percent. The zinc concentrate averages about 49 percent zinc, with about 92 percent recovery. The tailing average about 0.9 percent zinc and 0.3 percent lead.

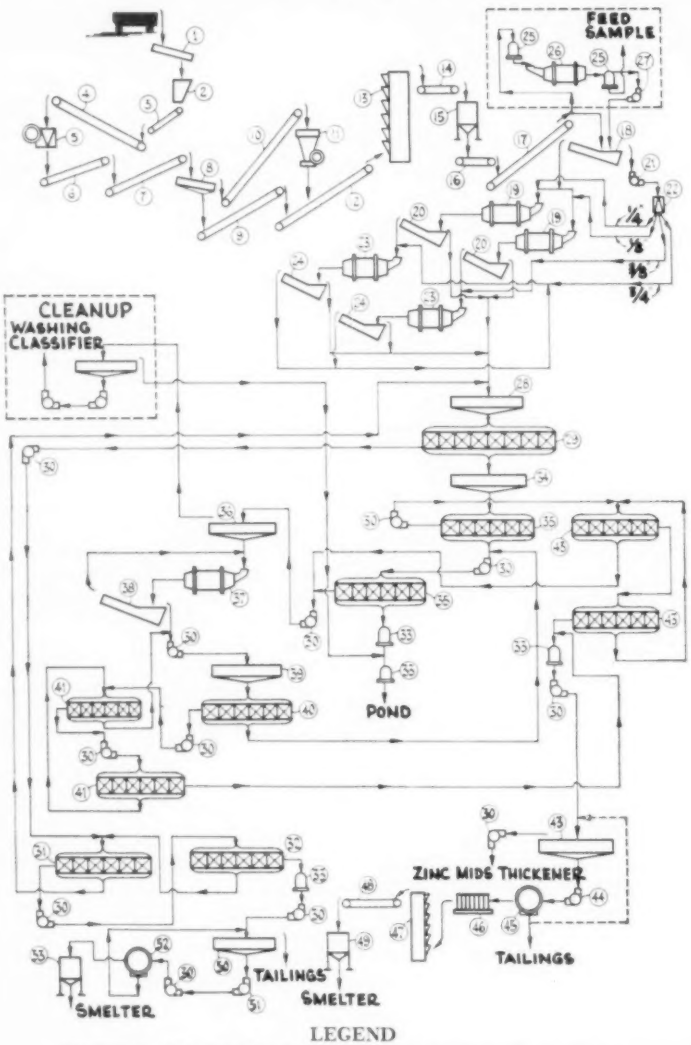
Flowsheet and Equipment

Mine-run ore is dumped over a grizzly with 12-inch spacings into the coarse-ore storage pocket of 3,000 tons capacity. The ore is drawn out through a Ross chain feeder to a conveyor belt and dumped into the primary crusher, a 24 by 42-inch Buchanan type C, set



ROD AND BALL MILL GRINDING CIRCUIT where Marcy rod mill (left) in open circuit with Akins classifier produces flotation feed and sand for regrinding in Eimco ball mill in closed circuit with Akins classifier. Grind is to minus-100-mesh.

Flowsheet Eagle Mill
New Jersey Zinc Company Gilman, Colorado



LEGEND

CRUSHING AND GRINDING

1. Grizzly, 12-inch spacing.
2. Storage pocket, 3,000-ton.
3. Ross chain feeder.
4. Conveyor belt.
5. Buchanan jaw crusher, 24- by 42-inch.
6. Conveyor belt.
7. Conveyor belt with magnet over tail pulley and magnetic head pulley.
8. Tyrock screen, 4- by 8-foot.
9 and 10. Conveyor belts.
11. Symons 4-foot cone crusher.
12 and 14. Conveyor belts.
13. Bucket elevator.
15. Fine ore storage, 450 tons.
16. Feeders.
17. Conveyor belt.
18. Dorr, duplex single-deck washing classifier.
19. Marcy rod mills, two 4- by 10-foot.
20. Akins classifiers, two 54-inch.
21. Pump.
22. Rotary pulp splitter.
23. Eimco ball mills, two 6- by 6-foot.
24. Akins classifiers, two 54-inch.

FEED SAMPLING

25. Chain and bucket sampler.
26. Rod mill, 2- by 4-foot.
27. Pump.

FLOTATION CIRCUITS

28. Wemco conditioners, three 8- by 8-foot.
29. Agitair roughers, 16 No. 48.
30. Pump.
31. Agitair cleaners, 4 No. 36.
32. Agitair recleaners, 4 No. 36.
33. Sampler.
34. One Wemco, one Denver conditioners, each 8- by 8-foot.
35. Two 12-bank Agitair No. 48, one rougher and one scavenger.
36. Thickener.
43. Two banks cleaners, five Denver No. 21.

RETREATMENT CIRCUIT

37. Hardinge conical ball mill.
38. Akins classifier, 24-inch.
39. Denver conditioner, 4- by 4-foot.
40. Eight Agitair roughers, No. 36.
41, 42. Eight Denver cleaners, No. 18, two stages of four each.

ZINC CONCENTRATE DRYING

43. Two Hardinge thickeners, 20-foot.
44. Diaphragm pump.
45. Eimco 7-disc, 6-foot filter.
46. Ruggles-Coles dryer, 80-inch by 45-foot.
47. Elevator.
48. Flight conveyor.
49. Six concentrate bins.

LEAD CONCENTRATE

50. Hardinge 20-foot thickener.
51. Diaphragm pump.
52. Eimco 3-disc, 6-foot filter.
53. Concentrate bin.

at 3 inches. Two conveyor belts, the second having a magnet over the tail-pulley-end and a magnetic head pulley, elevate the crusher product to a 4- by 8-foot Tyrock screen, with ½- by 5-inch slots. The screen oversize is conveyed to the secondary crusher, a 4-foot standard Symons, set at ⅜-inch. The screen undersize and secondary crusher product are carried to the fine ore storage tank of 450 tons capacity by two conveyor belts and a bucket elevator.

Fine ore is fed to a conveyor which passes over a Merrick Weightometer and discharges to the washing classifier, a duplex Dorr single-deck. A feed sample is cut by a chain-and-bucket and fed to a 2- by 4-foot rod mill. The rod-mill discharge is sampled by an automatic sampler. Sampler reject is pumped back to the washing classifier. Feed to the classifier is split, so that half the sand goes to each of the rod mills. The overflow is screened in a trommel, to remove wood chips, and pumped to a rotary pulp splitter. One-eighth of the pulp goes to each rod-mill feed launder and three-eighths to each ball mill. Lime is added to the pulp distributor feed pump and 1.0 pound of sodium sulfite per ton of feed to the pulp distributor.

The grinding section is divided into two parallel sections of two stages. The first stage consists of two 4- by 10-foot Marcy rod mills, each in open circuit with a 54-inch Akins classifier. Classifier overflows, about 35 percent solids, go to flotation. Sands go to two 6- by 6-foot Eimco ball mills for final grinding. Each ball mill is in closed circuit with a 54-inch Akins classifier. The final grind contains about 10 percent plus-100-mesh material. Pine oil is added to No. 4 Akins overflow.

Ground pulp is fed to three 8- by 8-foot Wemco conditioners in series, each equipped with a 24-inch turbine-type propeller. Electrodes for the automatic pH system are in No. 1 conditioner. Sufficient lime to regulate the pH at 7.0 to 7.5 is added to this conditioner. Sodium cyanide, 0.07 pound per ton, is added to the overflow of No. 2 conditioner. Amyl xanthate, 0.03 pound per ton, is added to No. 3 conditioner. The lead roughers are 16 No. 48 Agitair cells. Rougher concentrate is pumped to the cleaners, 0.03 pound per ton of cyanide being added to the No. 1 rougher launder. Presently, eight No. 36 Agitair cells, arranged in two stages of four cells each, are used for cleaners. Middling flows to No. 1 conditioner; concentrate is sampled and pumped to the drying plant. 0.001 pound per ton of Separan 2610 is added to the lead thickener feed. The lead thickener is a 20-foot Hardinge; the filter is a 3-disc, 6-foot Eimco,

equipped with snap-blow and agitator. Filter cake drops into a storage bin; it is shipped to the ASARCO smelter at Leadville, Colorado.

Lead tailing flows to two 8- by 8-foot conditioners in series, one Wemco and one Denver, each with a turbine-type propeller. Copper sulfate, 1.5 pounds per ton, is fed to No. 1; lime, 0.10 to 0.15 pound of xanthate, and pine oil are fed to No. 2. Electrodes for the zinc section pH control are in No. 2. The zinc section consists of 12 Agitair No. 48 roughers and 12 Agitair No. 48 scavengers. Rougher concentrate is split and cleaned in two parallel banks of five Denver No. 12 cells, each having three first- and two second-stage cells. Middling and scavenger concentrate are thickened and fed to the retreatment circuit. This circuit consists of a Hardinge conical ball mill in closed circuit with a 24-inch Akins classifier, a 4- by 4-foot Denver conditioner, eight Agitair No. 36 roughers, and eight Denver No. 18 cleaners in two stages of four cells each. Zinc concentrate is sampled and pumped to the drying plant where it is split to two 20-foot Hardinge thickeners. Thickener underflow is filtered in a 7-disc, 6-foot Eimco filter, the filter cake being fed to an 80-inch by 45-foot Ruggles-Coles dryer. Dried concentrate is stored in six bins. It is shipped either to Canon City, Colorado, to a company roasting plant, or to East Chicago, Illinois for roasting, in either case going on to the company smelter at Depue, Illinois. Tailings are sampled and flushed through a pipe line to a pond at Rex.

Personnel

The mill is operated normally three shifts a day, five days a week. Each mill shift consists of a boss and five men—grinding section, lead section, zinc section, dryer operator, and utility man. The mill crews work two weeks on each shift and then change to the next earlier shift. The crushing plant is operated on day and evening shifts only, with two men on a shift. There is a five-man repair crew, each of whom has two days off during the week. Saturdays and Sundays, day shift only, are used for repairs. One man mixes reagents, on day shift only. A yard gang of 11 men and a boss load out concentrate and copper ore, unload incoming merchandise, burn scrap wood from the mine, and take care of miscellaneous labor in the mill and Belden area. One man takes care of the tailing pond.

Water Supply

The bulk of the water for the grinding section comes from the deepest level of the mine. It has a temperature about 71° F. and a pH about 8.0. Flotation results are poor if the temperature of the pulp is lower than 65° and, formerly, the pulp had to be heated. Use of the warm water affords a considerable saving of fuel oil. For floor washing and some make-up in the grinding section, water from Eagle river is used. A pumping station, consisting of two Quimby-Ryan sump pumps, 1,000 gallons per minute capacity each, and two Aldrich centrifugal pumps, 2,000 gallons per minute capacity each, provides this water. A high-pressure water source is Fall Creek, a tributary of the Eagle River. A 16-inch pipe line delivers water at a 6,000-foot head. This water is used to drive two compressors and a generator during the run-off season, for most of the pump glands, washing, drinking water, fire protection, and the domestic water for Gilman.

During the winter months, heat for the mill and surface buildings at Belden is provided by a 100-horse-power Kewanee-Iron Fireman packaged boiler.

Size Type and Use of Pumps at New Jersey Zinc Company's Eagle Mill

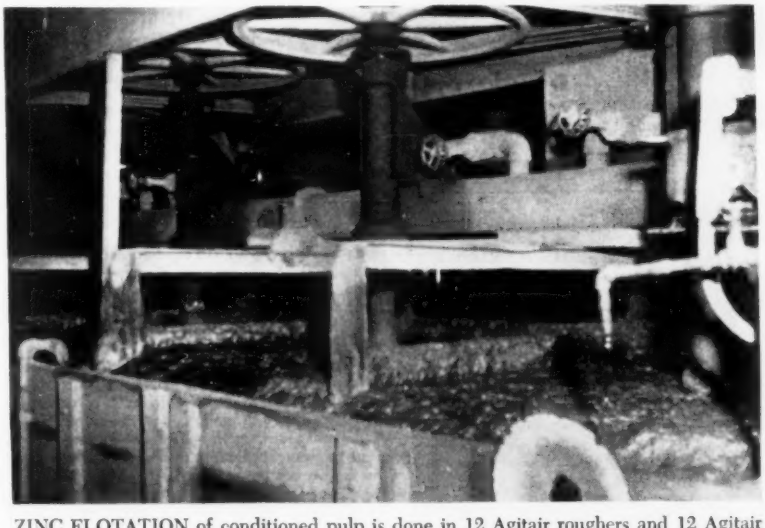
Service	*Type and Size*
Washing classifier overflow to pulp splitter	4-in. Krogh
Feed sampler reject to washing classifier	2-in. Krogh
Lead rougher concentrate to cleaners	3x3 SRL; 3-in. Krogh Standby
1st lead cleaner concentrate to 2nd cleaner	3-in. Krogh
Clean-up thickener underflow to washing classifier	Dorrco Suction; 5x4 SRL-C
Lead concentrate to dryer	3-in. and 2-in. Wilfley
Zinc rougher concentrate to cleaners	4-in. Wilfley
Zinc middling to thickener	4-in. Wilfley
Zinc rougher tailing to scavengers	5x4 SRL-C
Regrind classifier overflow to conditioner	3x3 SRL
Retreatment rougher concentrate to cleaners	3-in. Krogh
1st retreatment cleaner concentrate to 2nd cleaner	2-in. Krogh
Zinc concentrate to dryer	4-in. Wilfley
Zinc thickener overflow to middling thickener	3-in. Krogh
Zinc concentrate to filter	Dorrco Suction-pressure
Lead concentrate to filter	Dorrco Suction; 2-in. Krogh

Reagent Handling

Lime, xanthate, sodium sulfite, and copper sulfate are stored in the underground reagent room at the loading-dock level. Solutions and slurry are mixed at this point and pumped to storage tanks in the mill. Pine oil, purchased in tank-car lots, is stored outside and pumped to a storage tank in the mill as needed. Sodium cyanide is mixed and stored in the mill. Lime, xanthate, copper sulfate, and sodium sulfite are handled by a battery-powered fork-lift truck.

The town of Gilman has the company offices, residences for about 475 people, a post office, club house, two stores, staff boarding house, a clinic with a doctor and nurse, and plumbing, carpenter, electrical, and automotive shops.

THE END



ZINC FLOTATION of conditioned pulp is done in 12 Agitair roughers and 12 Agitair scavengers. Rougher concentrate is cleaned in two banks of five No. 21 Denver cells to produce a 49 percent zinc concentrate with about 92 percent recovery.

How Selective Crushing of French WO_3 Ores Is Key to Gravity Concentration

By PIERRE SEYER

Gravity concentration methods in France have reached a high degree of efficiency for the recovery of tungsten and tin from low-grade ores. Important features of the six largest tungsten mines and the major tin mine are shown in Table No. 1.

The tungsten mines normally supply more than two-thirds of the requirements for French industries. Because of the importance of these mines, a series of articles have been published in the French *Annales des Mines*. This is an abstract of those articles with the hope that the latest studies and ore dressing methods at these French mines will be of interest and value to other metallurgists in all parts of the world.

Mines and Ore Deposits

Abbaretz is a tin mine comparable in many respects to the Manono mine of Geomines in the Belgian Congo (See MINING WORLD, November 1952, Pages 32-37). The Abbaretz deposit is being mined on the surface; the mining, transportation, and ore treatment are patterned after those in use at Geomines.

The Montmins deposit is entirely in a class of its own, as compared with the other deposits in the wolframite area in the southwestern part of Europe: France, Spain, and Portugal. Associated minerals in the deposit contain quartz which occurs in three formations: regularly shaped veins several decimeters in thickness; numerous irregularly shaped veinlets; interspersions of a few square centimeters; embedded in the schists. In addition, and unlike the other mines, the wolframite mined at Montmins never occurs in large massive form but generally as fine needle-like crystals which, in the main veins, are agglomerated in bands paralleling the country rock. In 1945, when the mine started producing, the deposit was mined under ground, with extraction confined to the quartz veins, and the mill fed with relatively high-grade ores. Since 1955, the company has mined all the mineralized mica schist zone by open pitting with ore assaying from 0.2 to 0.3 percent WO_3.

The other five mines: Puy Les Vignes, Montbelleux, Leucamp, Montredon, and Teissieres, are more conventional. Here, wolframite occurs in quartz veins, either in disseminated form or in more or less important pockets, and generally as crystals exceeding one millimeter in size. However, there exists at Puy Les Vignes a stockwork whose least mineralized sections are being mined underground.

With regard to the mineralogical constitution of these crude ores, it is interesting to note that, in addition to the quartz gangue material of the veins, the material entering the mills contains more or less high proportions of country rock, such as schist, mica schist, or metamorphosed pegmatite. In addition to cassiterite at Abbaretz and wolframite at the remaining six mines, there are: small amounts of cassiterite at Montmins; varying amounts of scheelite at the remaining five wolframite mines; small amounts of bismuthenite at Puy Les Vignes; varying amounts of pyrite and arsenopyrite at all the mines, save Montmins (certain ores from Puy Les Vignes contain pyrite to an amount of 20 times that of wolframite); and lastly, tourmaline throughout the wolframite mines in the form of needle crytsals which are rather difficult to separate from the fine wolframite.

Mr. Seyer is Inspector General in charge of the French Overseas Territories. He has a long background of mining and metallurgical experience in all parts of the world. He has mined in Algeria, Madagascar, Bolivia, and held important governmental positions in French West Africa and France. In 1953 he organized, and presided over, the Congres des Laveries des Mines Metallurgiques Francaises, on which occasion he successfully appealed to his foreign colleagues to organize periodically ore dressing congresses in various European countries. It was precisely this appeal of his that led to the organization of the highly successful International Ore Dressing Congress held at Goslar in 1955 and at Stockholm in 1957, both of which were attended by numerous technicians from the United States.

Key Metallurgical Steps

Desliming: The Abbaretz mill is equipped with special types of log washers receiving the crude ore after reduction to minus-50-millimeters in a Hazemag impact crusher. In these log washers, the barren mica schist is separated, suspended in water, and discharged into the overflow, whereas the insignificantly altered mineralized quartz fractions are collected in the underflow. By eliminating 50 to 75 percent of the feed these log washers ensure true preconcentration.

Crushing: This is performed in two or three stages, each unit generally preceded by a screen to bypass the fines. Taken in the previously indicated order, the largest sizes of the crushed ore are as follows: 10-2-10-8-6 and 6 mm. Crushing at Montmins is to minus-2-millimeters which is a clear index of the exceptionally fine mineralization of the deposit.

Scalping: At Abbaretz, this is carried out in large Harz jigs for the minus-10, plus-3-millimeter sizes. The waste material from these machines is crushed before retreatment. At Montmins, scalping takes place in diaphragm jigs for the minus-2-millimeter pulp previously deslimed in cyclones.

Preconcentration: This process is used at Montmins where crude ores, after desliming and scalping, are treated in two series of Humphreys spirals acting as roughers and scavengers. At Puy Les Vignes where the minus-10, plus-2-millimeter fraction is run through Hancock jigs whose preconcentrates are reduced to 7 millimeters before retreatment. At Montbelleux, by selective crushing of the plus-8-millimeter fraction of the crude ore and screening off, at that size, with the oversize discarded as waste.

The amount of waste thus eliminated averages 32 percent of the crude ore at Montmins, 45 at Puy Les Vignes, and 60 at Montbelleux.

After scalping and preconcentration (if used), the crushed ore is generally screened into more or less close fractions. The coarse product is treated at Abbaretz in Denver jigs

receiving the minus-3-millimeter fraction. Leucamp uses five plunger jigs on five sizes of feed ranging from 6.0 to 0.5 millimeters. At Montmins on Plat'O shaking tables receiving the hydraulically classified minus-1-millimeter fraction. Similar to that at the large Portuguese Panasqueira mine.

For this purpose, all of the mills make use of different types of shaking tables. At Montmins, the tailings from the Plat'O primary tables are processed substantially in the same manner as the crude ore. These mineralized tailings are successively passed through a ball mill, deslimed in a cyclone, scalped by jigging, and finally, preconcentrated in two sets of spirals eliminating 25 percent of the original feed as clean tailing.

Two plants, Montmins and Puy Les Vignes, employ Buckman tilting tables for treating the extremely fine fractions.

Generally the concentrates from the first stage of treatment are not clean enough to be refined; as a result, they are recleaned by tabling, less frequently by jigging. These secondary machines yield mineralized tailings which, combined with the primary middlings, are retreated both with and without primary grinding.

To insure production of commercial grade concentrates, it is necessary to remove the large amount of pyrite in the ore which naturally is retained with the gravity concentrates.

At Puy Les Vignes, Montbelleux, and eventually at Abbaretz, normal practice is to desulphurize the plus-0.5-millimeter concentrates by table flotation as evolved at Panasqueira. These concentrates are first crushed to minus-2-millimeters. Moreover, at Puy Les Vignes, the minus-0.5-millimeter pulp is desulphurized by cell flotation prior to treatment on shaking tables.

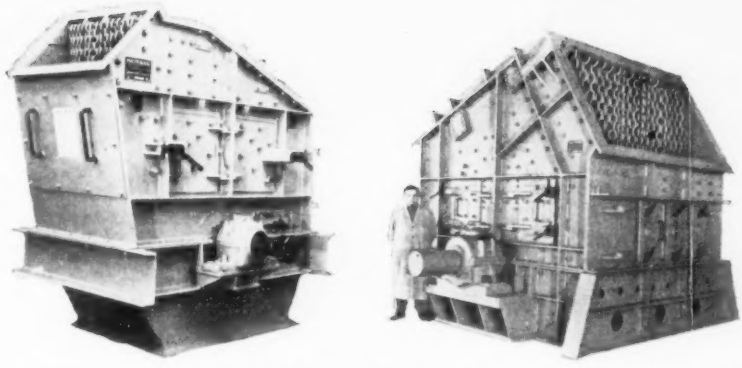
Desulphurization of the fine concentrates is done by electromagnetic separation.

All gravity concentrates are treated in magnetic separators to remove any metallic iron particles from crushing and grinding media which would contaminate the concentrate. Also, large magnetic separators are used to treat all concentrates to produce a saleable (weakly magnetic) concentrate and a non-magnetic fraction containing quartz, pyrite, and scheelite. The second concentrate is tabled to recover the calcium tungstate. At Montmins the nonmagnetic concentrate contains cassiterite which is recovered by tabling.

Montbelleux Selective Crushing

It is common knowledge to ore dressing specialists that, as a general rule, ores are actually crushed selectively with the larger fraction being lower grade than the fines. There are only a few examples where the coarse fraction of the crushed crude ore is low enough in grade to go to waste. The lead ore dressing plant of the Gewerkschaft Mechernicher Werke in Germany, which treats a conglomerate of siliceous pebbles with galena present in the matrix, can be considered as one such exception.

At Montbelleux, the wolframite bearing quartz veins are embedded in the hard, black, friable schists so that the mill feed invariably contains more than 50 percent schist. At the recent resumption of mining at Montbelleux, these schists were eliminated by hand-picking on a sorting belt placed at the head of the mill, thereby leaving only quartz for further treatment. Since May 1956, this expensive process has been discarded, thanks to selective crushing in an SAP 3 Hazemag impact crusher.



IMPACT CRUSHERS, large and small, are built by Hazemag. The unit at left, known as the SAP 4, has a capacity from 20 to 25 tons per hour. The large AP 5 Br., at right, is rated up to 400 tons per hour. Size is apparent in comparison with man.

The crude ore from the bin at the head of the circuit is fed at the rate of 10 to 12 tons per hour to a water-sprayed vibrating screen with eight millimeter openings, the oversize dropping into the impact crusher which discharges onto a second vibrating screen with the same openings. The oversize from this screen is low enough in grade to be discarded as waste; only the minus-8-millimeter fraction is concentrated.

Subsequent checks carried out by counting and weighing have shown that, on the average, the following proportions of components are eliminated or recovered, respectively, from the crushed ore:

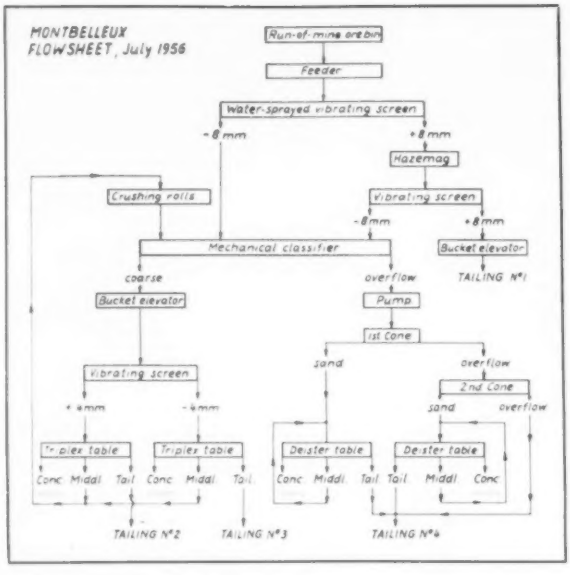
Elimination from the plus-8-millimeter fraction: 72 to 80 percent of schist, 22 to 28 percent of the quartz, and 5 to 9 percent of the wolframite. Recovery from the plus-8-millimeter fraction: 20 to 28 percent of schist, 72 to 78 percent of the quartz, and 91 to 95 percent of the wolframite.

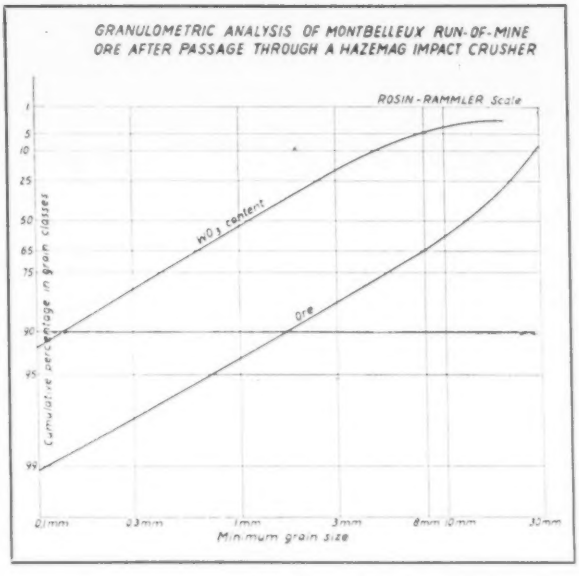
Table No. I
Tungsten and Tin Production by Seven Important French Mines in 1955

Mining Company	*Metric Tons Ore Mined*	*Metric Tons Concentrates Recovered*	*Kilograms of WO_3 or Sn Recovered per Ton*	*Number Men Employed*
Abbaretz	1,100,000	700	0.42	395
Montmins	215,500	416	1.28	230
Puy Les Vignes	34,800	149	3.0	170
Montbelleux	25,000	56	1.6	85
Leucamp	22,400	231	6.9	180
Montredon	16,500	104	4.4	75
Teissieres	5,400	35	4.7	57

Table No. II
Metallurgical Results at Montbelleux for June 1956

Product	*Metric Tons*	*Weight Percent*	*WO_3 Percent*	*WO_3 Weight Kilograms*	*Content Weight Percent*
Hazemag discharge, plus-8-mm.	1,827	61.1	0.032	584	8.5
Table tailings, 8 to 4 mm.	532	17.8	0.04	213	3.1
Table tailing, 4 to 0.3 mm.	387	12.93	0.04	155	2.2
Deister table tailing	226	7.55	0.07	158	2.3
Total tailings	2,972	99.38	0.034	1,110	16.1
Gravity concentrates	18.5	0.62	31.32	5,780	83.9
Feed	2,990.5	100.00	0.230	6,890	100.0





The tendency of the wolframite to concentrate in the crushed finer particles may be explained by the fact that the areas of contact between the quartz and wolframite crystals are zones of minor cohesion with the result that a mixed ore particle tends to break along these areas as soon as it hits the blow bars or the impact plates inside the impactor. This assumption is verified by the examination of a great number of plus-8-millimeter particles, with not one instance noted where a mixed particle contained a wolframite crystal of any notable size, say plus-2-millimeters. Volumetric analyses of the tailing revealed that the wolframite to quartz ratio varies from 1 to 2,000 to 1 to 8,000. On the other hand, there was evidence of the presence of a great number of mixed particles (quartz + pyrite) or (quartz + schist).

Simultaneously, there is the important question of whether the impactor produces a greater or smaller percentage of fine material, as compared with a jaw crusher. To this question, a competent answer was provided by the interpretation of the variation in the metal content of the tailings from the tables handling the minus-0.3-millimeter fraction from a Hazemag crusher. To treat this fine fraction, unfortunately, two tables were used simultaneously, instead of only one. As a result of these two modifications, the metal content of the fine tailing decreased from 0.09 to 0.07 percent. Thus, it became immediately apparent, as not evidenced at the outset, that with the Montbelleux ore as feed material, the impactor does not produce more fines than the jaw crusher.

The Montbelleux flowsheet is shown. It is characterized by simplicity because sulphide removal and refining of concentrates is done at Puy Les Vignes. Table No. II shows complete data on operation of the Montbelleux mill during June 1956.

A series of crushing tests on Montbelleux ore have been made at Hazemag's pilot plant using an impactor. The accompanying graph is plotted to show the percentage weight of ore and WO_3 in comparison with particle sizes. This graph, developed from the Rosin-Rammler equation, shows on the ordinate the double logarithm of the precentage cumulative weight of the grain classes, and on the abcissa, the logarithmic minimum size of the latter. Reference to this graph shows that plus-8-millimeter fraction contains 65 percent of ore, by weight, and 5 percent of wolframite.

Finally, it is worthwhile to mention that the Abbaretz mill engineers tested the selective action of the Hazemag impact crusher, Type AP 4 Br. on the plus-50-millimeter fraction of the crude ore. Assays and screen analyses of samples taken several days in succession from the crushed product indicate the following conclusions: plus-25-millimeter fraction 22 percent by weight, assays 355 grams of cassiterite per ton; minus-25-millimeter fraction, 78 percent by weight, assay 1,000 grams of cassiterite per ton. The run-of-mine ore assayed 858 grams per ton on the average. Unfortunately, mining at Abbaretz was abandoned before the practical application of selective crushing could be studied further.

Recommendations from Results

- 1. Recovery of the coarse tailing pulp at a point as close to the tables or jigs as possible and immediate return to the system.
- 2. Speedy control of the plant operation by organizing concentrate refining, reject sampling, and assaying so as to disclose the daily quantitative yield and the average assay of the rejects within a maximum of 36 hours.
- 3. Organization of sampling so as to secure truly representative samples. This entails calculating their minimum weight as a function of the grain size, entrusting these duties to reliable operators, and using heavy liquids to check jigging efficiency.
- 4. Lastly, comparing the results obtained from tailing analyses, by using either the conventional colorimetric method or the Haultain superpanner. The use of this machine ensures, up to a point, accurate assays of the amount of wolframite (or cassiterite) recoverable from commercial type industrial equipment.

THE END

REFERENCES

Allan, J. C., Smith, G. A. & Lewiss, R. I., The Panasqueira Mines, *I.M.M. Bulletin* no. 481, Nov. 1946, London.

Banks, H. R., Tin at the Sullivan Concentrator, *Canadian I.M.M. Bulletin*, Dec. 1941, Toronto.

Ferraud, J., Concentration des grains de wolfram de moins de 75 microns sur des tables basculantes françaises, *Revue de l'Industrie Minérale*, Jan. & Feb., 1954, Saint Etienne.

Grimaldi, F.S., & North, V., Colorimetric method for low grade tungsten ores and tailing analysis, *Industrial & Eng. Chemistry*, Oct. 15, 1943, New York.

Gyp., Poids à donner à un échantillon, Abaques d'échantillonnage, *Revue de l'Industrie Minérale*, Feb. 1946, Saint Etienne.

Mendes, F., Flutuocao em mesas nas minas de Panasqueira, *Technica 1949*, Lisboa.

Seyer, P., Nature et concentration des minerais de tungstène des mines des Montmins, *Annales des Mines* V., 1951, Paris.

Seyer, P., L'usine de concentration des minerais de tungstène de Puy les Vignes, Conditions de concentration des minerais de tungstène de la mine de Leucamp, *Annales des Mines VII*, 1951, Paris.

Seyer, P., La concentration des minerais de tungstène en France et dans le Monde, *Annales des Mines III, IV*, 1952, Paris.

United States

Personalities in the News——

Richard S. Newlin, vice president in charge of operations of the Anaconda Company, New York, has been elected president and director of the subsidiary company, Greene Cananea Copper Company. He succeeds **Clyde E. Weed** who is now chairman of the board of Anaconda.

Robert J. Longyear, former president of the E. J. Longyear Company, Minneapolis, Minnesota, has been appointed chairman of the board for the company. **Donald M. Davidson,** former vice president of the mining division, has been elected president.

Byron C. Hardinge was recently appointed chief metallurgist for Magnet Cove Barium Corporation, Malvern, Arkansas. Mr. Hardinge served as development engineer for Hardinge Company, Inc. at York, Pennsylvania before joining Magnet Cove's staff in 1957.

Cleland N. Conwell has joined the staff of Kennecott Copper Corporation at Hayden, Arizona as project engineer on the expansion program now being planned by Kennecott at the Ray Mines Division.

Stephen Metzger of Palmdale, California has been appointed assayer for the Territorial Department of Mines' assay office at Anchorage, Alaska. Mr. Metzger replaces **Bill Powell** who has resigned to teach the University of Alaska Mining Extension Course.

Harwell Cooper, former reverberatory furnace operator with San Manuel Copper Corporation, San Manuel, Arizona, is now serving as reverberatory furnace shift foreman for the Ray Mines Division of Kennecott Copper Corporation, Hayden, Arizona.

James M. Doyle, former Hibbing, Minnesota district safety engineer for the M. A. Hanna Company has been transferred to Iron River, Michigan where he will supervise safety at Hanna's Cannon mine, Groveland and at Moose Mountain, Ontario, Canada when operations resume.

Dr. Cleveland E. Dodge, vice president of Phelps Dodge Corporation, Douglas, Arizona, was awarded an honorary degree of Doctor of Letters by the University of Arizona recently.

FRANK A. WARDLAW, JR. has been appointed resident consulting engineer and sales representative in the Rocky Mountain area for the Engineering and Construction Division of Southwestern Engineering Company. His offices are located in Salt Lake City, Utah. Mr. Wardlaw was associated with the Anaconda Company and its subsidiaries for more than 34 years, prior to joining Southwestern. In his new position, he will represent Southwestern in the design, engineering, and construction of metallic and non-metallic mineral processing plants.

JOSEPH E. MCLEAN (left), commissioner of the New Jersey Department of Conservation and Economic Development, extends good wishes to State geologist MEREDITH E. JOHNSON upon his retirement after 30 years of public service. Dr. KEMBLE WIDMER (right) succeeds Mr. Johnson as state geologist and chief of the Bureau of Geology and Topography. The state geologist's office is responsible for obtaining information pertaining to the geology, mineral resources, underground waters and topography of the state. Duties include mapping surface and subsurface geology and determining the distribution of their chemical and physical properties.

Edward J. Matousek, former chief power engineer with International Minerals & Chemical Corporation, has been promoted to manager of general engineering. **William E. Wivell,** former chief chemical engineer, was also promoted to manager of process engineering.

Several changes in duties and titles of personnel have resulted from a new supervisory organization now in effect at Kennecott Copper Corporation's plant at Ray, Arizona. **A. L. Dickerson** is now maintenance superintendent; **R. W. Ballmer** is production superintendent; **F. R. Sargent** is scheduling foreman; and **C. W. Taylor** is pit production foreman. **Karl K. Koropp,** former assistant superintendent at the refinery, is now operations superintendent and **Roland F. Johnson,** former master mechanic, is maintenance superintendent. **R. F. Gough** and **J. A. Norden, Jr.,** former assistant mine superintendents, now serve as operations superintendent and maintenance superintendent, respectively.

William E. Berthold has accepted a position as economic geologist for the New Mexico Bureau of Mines, a division of the New Mexico Institute of Mining and Technology. Mr. Bertholf will make his headquarters in Socorro, New Mexico.

Jack R. Miller and **William Kowalsky,** have established the consulting firm, J. R. Miller Company, with offices at 521 Fifth Avenue, New York 17, New York.

E. T. Casler, manager of the Florida Department of International Minerals & Chemical Corporation's phosphate minerals division, Bartow, Florida, plans to retire August 31. **Floyd B. Bowen,** production manager of divisional operations, will assume direct responsibility for the management of the department.

Dr. Henry G. Fisk, director of the University of Wyoming's Resources Research Institute, has been named Rocky Mountain vice chairman of the Industrial Minerals Division of the American Institute of Mining, Metallurgical, and Petroleum Engineers.

Frank W. Denny is now smelter superintendent at Phelps Dodge Corporation's New Cornelia Branch, Ajo, Arizona. Mr. Denny succeeds **James W. Byrkit,** who is retiring from active service with the company. **Forrest R. Rickard** replaces Mr. Denny as general smelter foreman.

Robert McChesney has accepted a position as chief chemist at Kennecott Copper Corporation's Ray Mines Division, Hayden, Arizona. Mr. McChesney formerly served as metallurgist with the United States Steel Corporation at Donora, Pennsylvania.

Carl H. Cotterill was recently promoted to executive assistant in the executive department of American Zinc, Lead & Smelting Company, St. Louis, Missouri. Mr. Cotterill joined the company in 1940 as a metallurgist and since 1949 has served as plant and process investigator.

James Halley was recently transferred from Kennecott Copper Corporation's Hurley, New Mexico operations to the company's new smelter at Hayden, Arizona where he will serve as smelter metallurgist. Mr. Halley was formerly employed as reverberatory section foreman. **Alfred W. Mercer,** smelter maintenance foreman, was also transferred from Hurley to assume similar duties at the Ray Mines Division smelter in Hayden.

Rudolph Ekar has been appointed chief mining engineer for the Snyder Mining Company, Duluth, Minnesota, replacing **A. C. Borgeson** who recently retired. **Mauri E. Erkkila** has assumed the former duties of Mr. Ekar as assistant chief mining engineer for the company. **Theodore J. Barker** has been appointed superintendent of the Whiteside mine, Buhl, Minnesota, following the retirement of **R. M. Baker.**

WILLIS M. JOHNS has accepted a position with the Montana Bureau of Mines & Geology as geologist-in-charge of the field station established at Kalispell, Montana by the Bureau as a cooperative venture, known as the Northwest Montana Mineral Resources Survey, with the Great Northern Railway and the Pacific Power & Light Company. Mr. Johns received his master's degree from Montana School of Mines this year, and has been engaged in several Montana Bureau of Mines & Geology projects involving minerals research and surface geology mapping. He was also employed as geologist for American Smelting & Refining Company in Salt Lake City, Utah at one time, working on exploration projects.

Jess Larson of Washington, D. C. has been elected president of the Uranium Institute of America, succeeding **General Patrick Hurley** who has retired. General Hurley was named president-emeritus of the organization. Mr. Larson is former administrator of the Defense Materials Procurement Administration, and of the General Services Administration.

James F. Smith, former general superintendent of the Anaconda Aluminum Reduction Works at Columbia Falls, Montana, has been promoted to manager of the operation. Mr. Smith succeeds **H. G. Satterthwaite** who has retired.

Homer S. Anderson, resident engineer, has been appointed manager of the mining department of the New York & Honduras Rosario Mining Company with offices in New York, New York.

Jack Anderson has joined the staff of International Mineral & Chemical Corporation as a chemist with the Florida Research Division, Bartow, Florida.

Richard E. Mieritz, consulting mining engineer of Phoenix, Arizona, recently returned to the United States from a professional trip to Brazil.

Charles J. Potter, president of Rochester & Pittsburgh Coal Company and Vitro Minerals Corporation, has been elected a director of Vitro Corporation of America, Salt Lake City, Utah. Vitro Minerals is a subsidiary of Vitro Corporation and Rochester & Pittsburgh Company.

Ira K. Hearn, Jr. has been appointed assistant general manager of the Utah Copper Division of Kennecott Copper Corporation at Salt Lake City, Utah. Mr. Hearn, who was formerly chief industrial engineer of the company's Western Mining Divisions, succeeds **F. C. Green** who was recently promoted to general manager.

John S. Hassett has been appointed assistant manager of mining plans and controls with the Lake Superior Mining Division of Pickands Mather & Co. at Cleveland, Ohio. Mr. Hassett has been associated with mining department since 1951 and prior to that was assigned to the company's coal and safety departments.

Obituaries

Upton William Harwood, pioneer California-Nevada mining engineer, died recently in Albuquerque, New Mexico. Mr. Harwood was active in mining camps of California and Nevada for the major portion of his life, and for the past 25 years his activities centered in the middle Buttes district near Mojave, California. Prior to his death he was engaged in uranium work in New Mexico.

Michael P. Walle died recently following surgery in a Duluth, Minnesota hospital. Mr. Walle was chief research engineer for the State of Minnesota Department of Lands & Minerals.

Professor Alexander N. Winchell died recently in New Haven, Connecticut after a short illness. Professor Winchell retired from the faculty of the University of Wisconsin in 1944 and since that time had been active as a consultant for several research laboratories.

John H. Hearding, one of the first pioneer mining men on the Mesabi Range, died recently at the age of 93. Mr. Hearding began his career in iron mining at the Norrie Mine in 1887. He was later employed with Lake Superior Consolidated Iron Mining Company, and joined the staff of Oliver Iron Mining Company (now Oliver Iron Mining Division, U. S. Steel Corporation) in 1904. He served in various executive capacities with Oliver before retiring in 1932.

L. F. Nielson, mining pioneer and president of Nielson and Company, Inc., The Philippines, died recently at the age of 56. Mr. Nielson, founder of Lepanto Consolidated Mining Company in Baguio, was also president and chairman of Hongkong Mining Company.

James L. Bruce, vice president, consulting engineer, and director of Cyprus Mines Corporation, Los Angeles, California, died recently at the age of 77. Mr. Bruce began his long association with Cyprus in 1925, as manager and resident director in Cyprus. In 1939 he became vice president, consulting engineer, and director. Mr. Bruce was responsible for the design of the sulphuric acid autoxidation plant which was completed in Cyprus in 1951.

Cecil Gordon Fennell, 85, died recently in Phoenix, Arizona. Mr. Fennell was credited with building, owning, and operating the first smelter in Arizona, located at Humboldt. Mr. Fennell developed the Gladstone and McCabe gold mines near Humboldt and was also active in the Lake Pend Oreille region of Idaho.

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Newsmakers in International Mining

F. C. STEVENS has been appointed assistant general manager of Mount Isa Mines Limited, Mount Isa, Queensland, Australia. Mr. Stevens has been associated with the mining industry since 1936, and has been chief engineer at North Broken Hill Ltd.'s mines in Broken Hill, New South Wales since 1950. LESLIE M. SWEET, former chief accountant at Big Bell Mines Ltd., Western Australia, was recently appointed assistant to the general manager of Mt. Isa Mines.

J. K. Whatmough, of Winipeg, Canada, has accepted a position as mining engineer with the Ontario Securities Commission, with headquarters in Toronto, Canada.

W. Donelly, former mine manager of new Modderfontein Gold Mining Company, Ltd., Benoni, Transvaal, Union of South Africa was recently transferred to East Rand Proprietary Mines, Ltd., as section manager of the Western Section, following the shutdown of New Modderfontein operations.

Otto F. Weber was recently re-elected president and manager of Suriago Consolidated Mining Company, Inc., The Philippines. **Miguel Ortiga** was elected vice president; **Placido Adad,** treasurer; and **F. A. Sanotos** was reappointed assistant secretary and assistant treasurer.

A special committee has been established by the Ontario, Canada Bureau of Mines to investigate mining systems used in uranium mines in the Elliot Lake area, where 14 fatalities have occurred this year. Serving on the committee are **Professor R. G. K. Morrison,** head of mining engineering at McGill University, **Professor A. V. Corlett,** head of mining engineering at Queen's University, and **Professor R. H. Rice** of the University of Toronto.

Amos M. White, formerly associated with the United States Geological Survey in Belo Horizonte, Brazil, recently arrived in the United States and is now residing at Princeton, New Jersey.

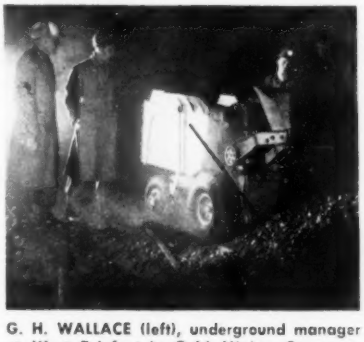
Arnold H. Miller, consulting engineer of New York, New York, is currently in Europe on professional business. Mr. Miller will visit principally in Spain, with stops in France and Italy.

ALBERT L. FAIRLEY, JR. is now executive vice president and director of the Dominion Steel and Coal Corporation, Montreal, Canada. In his new capacity, Mr. Fairley will serve also as executive vice president of the Dominion Coal Company, Ltd. and Nova Scotia Steel & Coal Company Ltd., Dosco subsidiaries. In addition, he is vice president, general manager, and director of the Snyder Mining Company of Pittsburgh, Pennsylvania.

Allan R. Gilbert and **John T. Logan,** both of Los Angeles, California, have been elected directors of Hamil Silver-Lead Mines Ltd., Vancouver, British Columbia, Canada. Both Mr. Logan and Mr. Gilbert recently inspected the company's property in the Highland Valley area of south-central British Columbia.

Solomon Lieb has resigned as representative and technical advisor to the Corporacion Minera de Bolivia and is now traveling in Europe and the Far East as consultant minerals engineer for an investment firm.

G. G. Stanley, formerly associated with Geduld Proprietary Mines, Ltd., Dersely, Transvaal, Union of South Africa, is now employed with Marievale Consolidated Mines, Ltd. at Marieshaft, Transvaal.



G. H. WALLACE (left), underground manager at West Driefontein Gold Mining Company, Carltonville, Transvaal, Union of South Africa, and M. P. O'CONNER, technical assistant to the consulting engineer of the Diamond Section of the Anglo American Corporation of South Africa, recently visited Sweden to study Swedish mining methods. Both men were winners of the first Atlas Copco Bursary and are attending a nine-month, post-graduate course at the Royal School of Mines in London, England. The course is intended to prepare men for executive positions in the mining industry. In the picture above, Mr. Wallace and Mr. O'Conner are shown at the Kiruna mine in Sweden.

Nelson Hogg has been appointed senior geologist with Hunting Technical and Exploration Services Ltd., Toronto, Canada. Mr. Hogg was formerly associated with Howe Sound Company as chief geologist in the Snow Lake Division, and as field geologist in the Toronto Exploration Division.

A. W. McNeil has been appointed general manager of Stanleigh Uranium Mining Corporation at Elliot Lake, Ontario, Canada, Mr. McNeil, who served with the Rhodesian Selection Trust companies in Africa for 27 years, was most recently employed as manager of Chibuluma Mines, Ltd. in Rhodesia.

Edmond Adolphe Maurice de Rothschild has been appointed a director of De Beers Consolidated Mines, Ltd., Union of South Africa. **D. G. Shepstone,** recently retired administrator of Natal, has been appointed director of the Aluminum Company of South Africa, Ltd.

H. E. LEE, vice president of the Bunker Hill Company, Kellogg, Idaho, will present a paper entitled "Bunker Hill's Pre-Sintering Practice" at a Sintering Symposium to be held in Port Pirie, Australia from September 2 to 6, 1958. Mr. Lee, accompanied by ANGUS BETHUNE, superintendent of Bunker Hill's electrolytic zinc plant, will also tour Australian mining and smelting plants. Mr. Lee is the only American presenting a paper at the Symposium.

P. G. F. Shaw, a member of the staff of Production Engineering Company, will spend a year at Nchanga Consolidated Copper Mines Ltd. to train and advise a Work Study Team which has been established to make observations and recommendations for a system of incentive bonus payments for various jobs on surface and underground. The Team, headed by **Arthur Hammer,** former sectional engineer with Engineering Contracts Department, is comprised of **R. Fairall,** underground electrical foreman; **W. J. Flaherty,** clerk of works, **J. J. Waller,** boilermaker; **T. H. Sjothun,** underground foreman rigger, **L. N. Diamond,** sectional engineer, **D. T. Abraham,** fitter and turner, **R. Williams,** fitter and turner, and **Sandy Mills,** electrician.

H. B. Chambers has been appointed vice president, metallurgy, with Atlas Steel Ltd., Welland, Canada.

William S. Row was recently elected president of Kerr-Addison Gold Mines, Ltd., Toronto, Canada. Other newly elected company officers include **James Y. Murdoch,** chairman of the board; **H. L. Roscoe,** vice president; and **K. C. Gray,** director. Kerr-Addison, Canada's largest gold producer, has a depth development program currently underway in the Larder Lake area of Ontario.

K. E. MacKay, former manager of Bancroft Mines Ltd. and now manager of Nchanga Consolidated Copper Mines, Ltd., Northern Rhodesia, and **D. Johnson,** assistant manager of Bancroft Mines, Ltd., have been jointly awarded the "Goldfields of South Africa, Limited, Gold Medal" for a paper entitled "The Development of the Bancroft Mine" published in the Transactions of the Institution of Mining & Metallurgy.

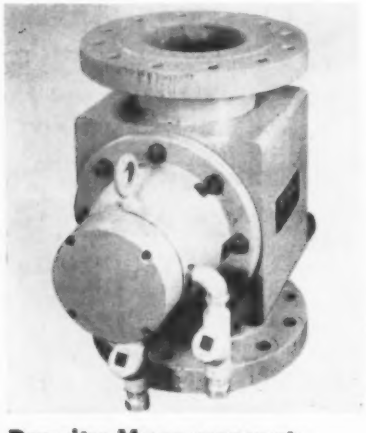
KARL V. LINDELL has been appointed president of the Joint Provincial Mining Associations of Canada for the two-year term of 1958-1959. Mr. Lindell is vice president and general manager of Canadian Johns-Manville Company, Asbestos, Quebec, Canada. He succeeds L. T. POSTLE of the British Columbia mining association as president of the Joint Provincial Association.

PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD'S way of making available to you some of the finest current information on mechanization.

Gravity Meter Can Be Read Directly From A Tripod

Completely portable gravity meter has several exclusive features says World Wide Instruments, Inc., manufacturers of the unit. A direct reading digital counter, facing upwards, and read like an automobile mileage recorder, enables operator to read without removing from tripod. A recessed level bubble avoids direct sunlight, thereby eliminating bubble creep. All units are equipped for world-wide range regardless of latitude without necessity for returning to laboratory for further range adjustment. Reading accuracy is 0.1 milligal. Small dial range of approximately 100 milligals minimizes resetting instrument in rugged terrain. For further information, contact the company, at 3802 S. Shepherd, Houston Texas.

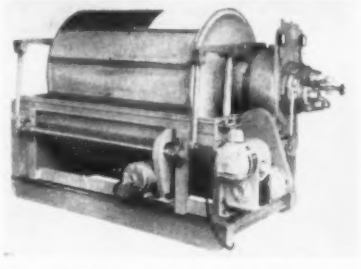


Density Measurements Using Radioactivity

Accurate density measurements of continuous flow systems is possible with an AccuRay Density System. Components of the system are manufactured by Industrial Nucleonics Corp. This method measures liquid density, specific gravity, percent solids, without any contact with the process material. AccuRay Density Measurement is based on the absorption of radiation by materials. When rays from a radioactive source are directed through a material or absorber, the amount of radiation reaching a detector (placed opposite the source) will depend upon the mass of the intercepting material. Changes in mass per unit volume will change the amount of radiation absorbed, thus providing a basic measure of density, percent solids, specific gravity, or other similar quantity. For the full story contact the company at 1205 Chesapeake Ave., Columbus 12, Ohio.

Bottom-Hole Drill Designed For Mine and Quarry Work

A new bottom-hole pneumatic drill has been introduced by Mission Manufacturing Company after more than 8 years of development. Known as Hammerdril, Mission's new drill is produced in both low and high pressure models. Depending upon air pressure and model, the machine can be adjusted to operate from 500 to 6,000 strokes a minute. The low pressure model has only 3 moving parts; the high pressure model features only 2 moving parts. Either unit can be used on any standard rotary rig with suitable air pressure capacity. The low pressure Hammerdril was designed for air in the 100 psi range. The high pressure model is for 250 psi and above. Units in both pressure ranges are available in sizes of 3⅝-inch and 5¼-inch outside diameter. An outstanding component of the drill is the Mission Hammerbit which features 6 massive tungsten carbide inserts. The unit will drill under water. For complete details, contact Mission, P.O. Box 4209, Houston, Texas.

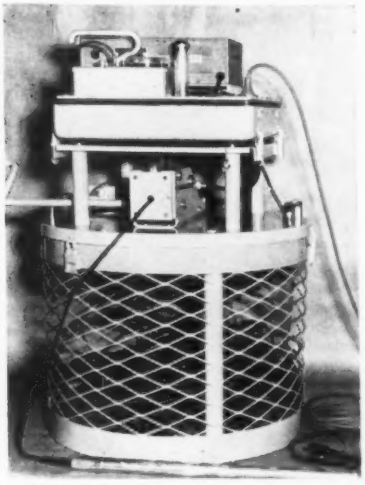


Dorr Oliver Inc. Develops New Plastic Drum Filter

A rotary drum filter constructed of fiberglass is now being marketed by Dorr-Oliver Inc. The unit was developed specifically for mildly corrosive applications which normally require special materials of construction. Cost of the plastic filter is said to be less than that of rubber-covered or stainless steel machines of comparable size and design. Dorr-Oliver reports that a prototype filter has been successfully tested at a uranium mill in western United States where it separated leached residues from acid leach solutions. Generally, components of the filter are fabricated of molded plastic with certain supporting structural members constructed of resin coated mild steel. The drum surface is divided into longitudinal section each of which is drained through molded rubber grids. "Waffle-like" in appearance, these grids can be snapped in and out of place for inspection. Filter tank is made of molded plastic. Full details are available from Dorr-Oliver Inc., Havemeyer Lane, Stamford, Connecticut.

Ceramic Magnet Boosts Drum Separator Efficiency

Latest development of Stearns Magnetic Products is a new permanent magnet drum used as a tramp iron separator and incorporating Indox V ceramic magnets. The Indox V magnets are said to produce an exceptionally uniform field up to 40 percent more powerful than could be achieved with ordinary permanent magnet materials. The new drum separator is designed for easy installation in any enclosed chute or spout conveying system. For information write Stearns Magnetic Products, A Division of The Indiana Steel Products Company, Valparaiso, Indiana.



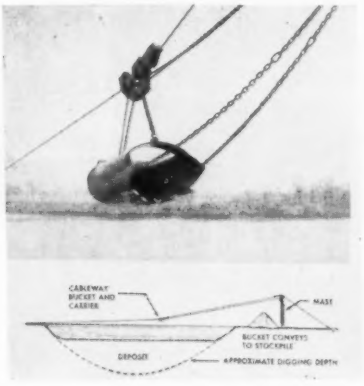
Radio-Activity Logger By Electro-Tech

Redesigned with an improved drive decoupler and cable handling system, the Electro-Tech RL-1 radio-activity logger is now available for permanent record logging in shot holes, core holes or surface outcrops. A completely integrated, self-contained instrument, the RL-1 operates from any normal 6 or 12 volt d-c source. Geiger counter output makes interpretation simple and exact and chart travel is in the ratio of 1 inch of chart motion for 8 feet hole depth. The halogen-quenched counter tube is sealed to withstand 250 lb/sq. in. pressure and is suspended by up to 250 feet of 320-lb breaking strength cable. Weighing 45 lbs complete with cable, cable basket, and vibrator power supply, the RL-1 is designed for reliable operation under all difficult field conditions. For further information contact the company at 5134 Glenmont Drive, Houston, Texas.

New Welding Product Joins 95% of Dissimilar Metals

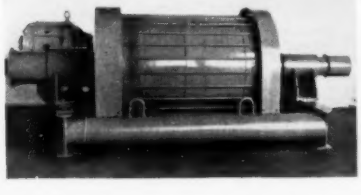
A new welding product designed to give predictable, high-quality automatic and manual inert gas welds in 95 percent of the dissimilar metal combinations that industry encounters was announced by International Nickel Company. Inco-Weld "A," capable of joining most dissimilar metals, is said to bring to inert gas welding these advantages: high strength, corrosion-resistant deposit; machinability; high impact resistance for sub-zero applications; and good elevated temperature properties.

A second product introduced by Inco, is a metal arc welding electrode for applying a hard protective surface to low alloy steels or cast irons which are subject to severe abrasion. Protective overlay is said to be structurally similar to Ni-Hard. For data contact the company at 67 Wall Street, New York 5, N. Y.



New Slackline Bucket Digs Harder, Tougher Material

New Slackliner bucket, designed by Sauerman Bros. Inc., was designed so that it is lighter in weight for a given strength. It requires, therefore, less line pull than other buckets of the same rated capacity. The bucket was planned for Sauerman Slackline Cableway Method illustrated by the sectional elevation drawing. The Slackliner bucket has a continuously curved cutting edge which is said to quickly penetrate hard digging material and move it into the bucket with a minimum resistance. The manufacturer says that users are reporting the Slackliner to be doing an excellent job digging tough material. Sauerman will supply you with complete details. Write 620 S. 28th Ave., Bellwood, Illinois.



Live Roller Mill Features A Unique Grinding Action

Live Roller mill pictured above features a unique grinding action which the manufacture claims will minimize over-grinding. Made by Live Roller Mills Manufacturing of Fresno, California, the unit is lined with a series of rollers extending from end to end of the shell. Conventional liners are not required. The mill pictured above is a 1¼ ton-per-hour model which was shipped to an Alaskan gold mining operation in September 1957. For further information write the company.

27
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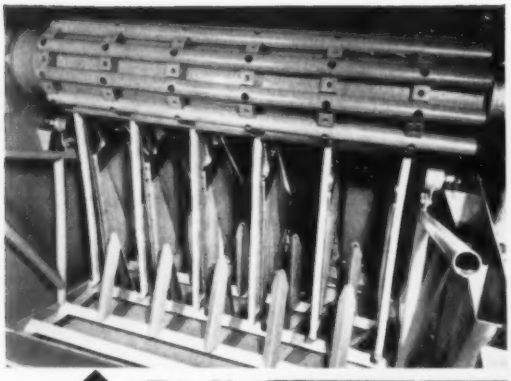
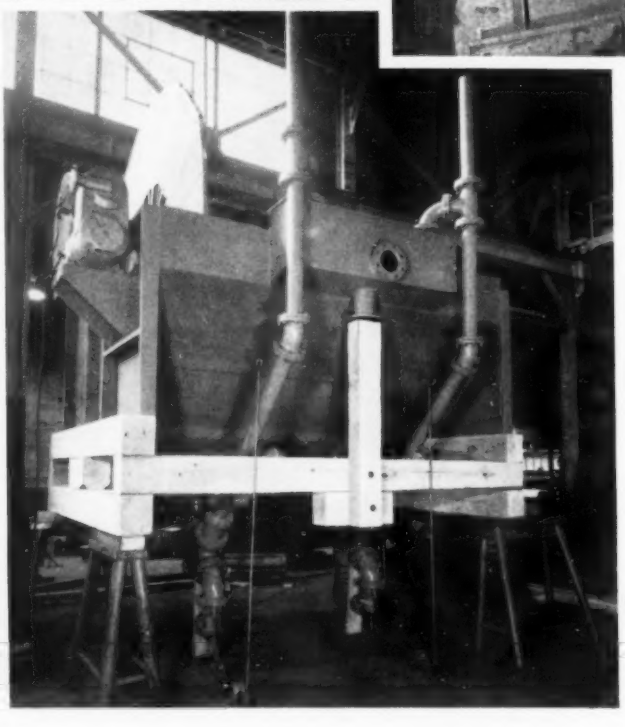


SWING TYPE AGITATOR, installed in filter tank, is shown in this close-up photo. Torsion bearings are at left and right, just under the main shaft.

TYPICAL INSTALLATION of American Disc Type Filter with air lift agitation provides efficient agitation of non-foaming slurries.



AIR LIFT AGITATION EQUIPMENT, consisting of valves and piping, is shown in this factory floor photo of partially assembled filter. No moving parts—pressure and quantity of air controls agitation.

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3 methods of agitation on AMERICAN FILTER

Dorr-Oliver's continuing search for improved techniques in wet processing has now resulted in three entirely different methods for slurry agitation on the American Disc Type Filter.

1. AIR LIFT AGITATION—means no moving or mechanical parts, the degree of agitation being controlled by the quantity and pressure of air injected. The result, on most non-foaming slurries where the introduction of air is not objectionable, is a homogeneous slurry and negligible maintenance.

2. SWING TYPE AGITATION—completely eliminates lubricating and stuffing box problems. This is accomplished by torsion bearings which incorporate a special rubber compound bonded to the agitator shaft to accommodate agitator assembly oscillation. This method is ideally suited for easily foamed or oxidizable slurries.

3. PADDLE TYPE AGITATION—with controlled variable speed drive, is also excellent for handling easily foamed or oxidizable material.

For more complete information, just drop a line to Dorr-Oliver Incorporated, Stamford, Connecticut.

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Construction of a $300,000 silica sand processing plant near Lapwai, Nez Perce County, Idaho, is planned by *Sunbeam White Sands, Inc.* of Moscow, Idaho, to handle sands mined midway between Spalding and Genesee. Filter sand would go to the Hanford, Washington, works of the *U. S. Atomic Energy Commission.* Sand blasting, glass, foundry, and finish plaster types of sand also would be produced. Fifteen to 20 men would be employed. Hugh P. Terteling of Moscow is company president-manager.

The *Garfield* lead-zinc mine in Blaine County, Idaho will be explored by *Viking Mines, Inc.*, a North Dakota corporation, under a contract approved by the *Defense Minerals Exploration Administration.* The contract calls for expenditure of $36,846 in sinking, drifting, cross-cutting, and long-holing. The property is in the Little Wood River mining district on the southwestern slope of Pioneer Mountain. The company's general manager is Verne L. McGowan of Grand Forks, North Dakota.

Triumph Mining Company, which closed its *Triumph* mine in Blaine County, Idaho's Hailey district last fall because of low lead-zinc prices, has arranged with *Machinery Center, Inc.*, Salt Lake City, for sale of plant and equipment, including a 300-ton concentrator. Operation of the mine has been intermittent over the past 80 years.

Exploration of the old *Livingston* mine of *Idaho Custer Silver-Lead Mines, Inc.* in Custer County, Idaho's Boulder District has been resumed by *Hecla Mining Company* of Wallace, Idaho. Crosscutting is underway toward areas where diamond drills made favorable intercepts of zinc-lead-silver ore.

Eastern exploration of the Alhambra fault vein structure by the *Bunker Hill Company* at its *Crescent* property in Shoshone County, Idaho, is exposing silver-copper ore of mineable widths. Several thousand feet of westerly drifting had exposed a number of short ore shoots. Exploration diamond drilling into the Aberdeen-Idaho area adjoining the Crescent on the north was started recently. Stanley McDougall is manager of Bunker Hill's Kellogg operations.

The lead-zince price situation has held up construction of a proposed concentrating mill at the property of *Lucky Friday Silver-Lead Company* east of Mullan, Shoshone County, Idaho. Plans call for utilization of mill tailings to fill mine stopes. Production, which has been averaging about 4,000 tons of ore monthly, is milled at the nearby Golconda custom plant. As of July 1st, the 2600 level had been opened by 375 feet of drifting easterly from the crosscut and 182 feet westerly. This drifting has been in good ore all the way in both directions. Near the end of May, the crosscut on the 3050 level reached the vein at a distance of 329 feet from the shaft. The vein on the 3050 level is strong and compares favorably, in both width and grade of ore, with the vein on the next higher level—the 2600. As of July 1st, a drift had been driven 19 feet easterly and 66 feet westerly from the crosscut on the 3050 level. Both faces were in excellent ore. For the time being the development on this level will be confined to the westerly drift. The ore reserves, estimated at 768,115 tons as of February 1, 1958, should be greatly increased by the subsequent developments now in progress on both the 2600 and the 3050 levels, neither of which had been opened at the time of the February 1st estimate.

Day Mines, Inc. has been stockpiling lead-zinc concentrates since June 1st from its *Hercules* mine and mill at Burke, Shoshone County, Idaho. Both the Hercules and the firm's *Dayrock* lead-silver mine have been operating at a loss since last fall because of low metal prices. The company's income is from silver-copper production at the *Galena* mine west of Wallace and from gold-silver ore being mined at its *Gold Dollar* property at Republic, Washington.

Among recent new incorporations in the state are: *Kip Mining Company* at Rigby, by Herb Shreffler, T. Harold Lee, Charles Casper, and Clifford Purser; *Copper Camp Inc* at Boise by Clarence Ray, Walter E. Ray, and James H. Hawley; and *Gardenia Mining Company* of Banks, by John S. Roberson and Guy Kofoed, both of Big Creek, W. O. Bedal of Crouch, and John W. Garrity of Nampa.

Silver Star-Queens Mines, Inc. has completed the sinking of a winze from the 450 level to the 850-foot level, with an additional 50 feet to be used as the sump for this level. A tail drift will be run out approximately 30 feet to serve as a pumping station. Approximately 25 feet of raising will be done to make the skip pocket for the level, and the station to be cut. When this work is completed, drifting on the 850 level will commence. The project has been largely self supporting, despite low prices for lead and zinc, with the aid of a DMEA loan. Garfield Voget is company president.

Monsanto Chemical Company is constructing a new private road between its elemental phosphorus plant at Soda Springs, Idaho and its phosphate mine 11.2 miles away. *Morrison-Knudsen Company* is constructing the road which will enable use of specially constructed carrier units capable of hauling 75 tons of ore each trip. This is three times the haul load possible with present transportation operations. The new facilities are to be ready for operation by the summer of 1959.

Salmon River Uranium Development Inc. is building a thorium ore concentrating plant on the *Sunny-Side* claims below North Fork, Idaho, on the Salmon River. The mill will have a capacity of 100 tons, and is being installed so that an increase in capacity can be made at a later date if desired. Roads have been improved; switchbacks widened and smoothed. Two tunnels have been driven to block out the ore and crosscut veins at a lower depth. One is 183 feet long, and the other 225 feet. Surface exploration reportedly has disclosed a 20-foot vein of thorium ore, and a large amount has been blocked out. Preliminary work on the dam for tailing has been started and also the pipeline and pump house for water supply are being built. The company expects to start production in the near future. J. G. Drent is foreman.

Rare Metals Corporation, Inc., is planning a placer mining operation on the South Fork of the Payette River, Boise County, Idaho. The firm has posted a $50,000 bond to guarantee that the land

U_3O_8 Found on Spokane Mt.'s Ingram Property

Extensive bulldozing activities are underway at Spokane Mountain Uranium Company's Ingram lease in Spokane County, Washington where uranium ore has been discovered. The deposit is approximately 50 feet long, with stringers of high-grade autunite and meta-autunite extending completely across the cut in a northerly direction. A ton of ore, mined as a test, assayed 78 percent U_3O_8. Twelve pounds of autunite crystals averaging 1½ inches thick and weighing up to ½ pound were also obtained. The company plans to develop the property with bulldozer cuts and a drilling program to block out the ore body. At the present time, open cuts are being made to expose the structure of the deposit. The deposit is located 1,200 feet northwest of an intersection of northwest striking faults and east-west striking shear zones where the largest and richest ore bodies in the region have been found.

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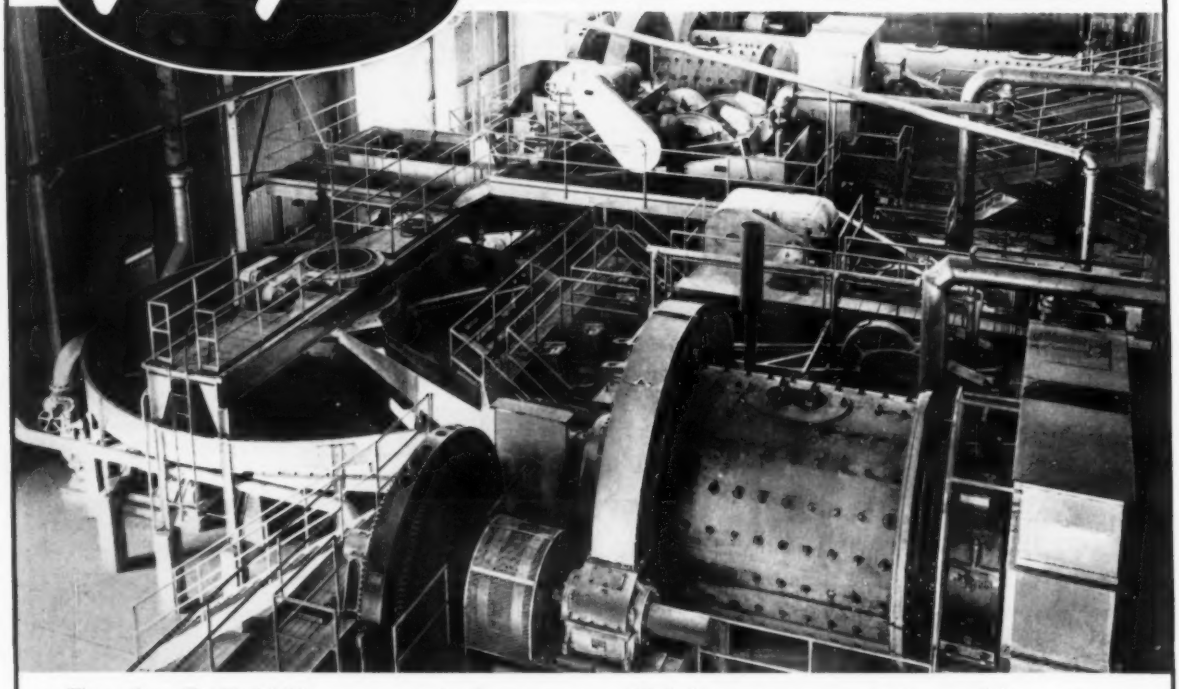

Traylor Ball Mills are made in two general types—overflow and diaphragm discharge. They are designed and built to be used for either wet or dry grinding. Shells are of all welded steel construction. The trunnions are cast integrally with the detachable heads. Main bearings are made of Meehanite* metal, each fitted with a high pressure Alemite pump. Driving gears are steel, precision cut on our Maag gear generator. Mills may be fitted with drum feeders, scoop feeders or a combination of the two.

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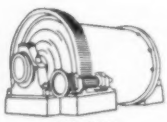
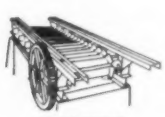
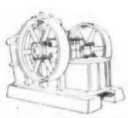
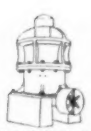

BALL MILLS

ROTARY KILNS


APRON FEEDERS

PRIMARY GYRATORY CRUSHERS


JAW CRUSHERS


SECONDARY GYRATORY CRUSHERS

will be restored. This satisfied a U. S. Forest Service objection that placer mining would interfere with recreation and other purposes for which the land was to be used. The claims, eight in number, are on National Forest land.

Extensive development of the *Little Bill* uranium property in Custer County, Idaho's Stanley area is planned this year by *Phillips Petroleum Company*. *Halverson Construction Company* of Jerome has been hired to construct a five-mile access road from Highway 93 between Stanley and Sunbeam. Preliminary work last summer yielded some commercial grade uranium ore which was shipped by rail from the Gimlet siding. The mine is owned by Bill Brooks, Juld Kauffman, and Melvin Peterson, all of Hailey.

All major lead-zinc mines in the Coeur d'Alene mining region of Shoshone County, Idaho now are on a four-day work week. The last to make the reduction was the *Page* mine of *American Smelting and Refining Company*. About 250 men were affected. J. C. Kieffer, Wallace, is general manger of Asarco's Northwest mining department.

OREGON

Lakeview Mining Company is sinking a three-compartment shaft at the *White King* mine near Lakeview, Oregon, to a depth of 700 feet. The new production shaft, which will have five stations, is located about 600 feet east of the present two-compartment shaft which is 312 feet deep. Its purpose was for exploration of the property.

Fred E. Mewhinney, Lewis A. York, and Arthur Johnson of Lakeview, Oregon have reported discovery of a cinnabar deposit about 10 miles southeast of Wagontire in Harney County. The men have 10 claims in the area and are continuing exploration work.

The Alvord Lake area of southern Harney County, Oregon is receiving much attention from prospectors. Approximately 50,000 acres are principally involved, where sodium borate deposits are located. Much of the land is federally owned, but federal prospecting permits for a two-year period are obtainable. Write to the Land Office of the *U.S. Bureau of Land Management*, 809 N.W. 6th Ave., Portland, Oregon, for further information.

MONTANA

Development of a silver-lead prospect near Eddy Creek, Montana is planned by a newly organized mining syndicate—*Montana-Coeur d'Alene Mining and Development Company*. Clarence Davis of Cheney, Washington is president, and Raymon Paulson of Rosalia, Washington is secretary-treasurer.

John Zupan of Sandcoulee, has started exploring a lead-zinc deposit at the *Doctor Kalloch* lode mining claim in Judith Basin County, Montana. The project, to cost $11,768, will consist of drifting, cross-

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cutting, and long-hole drilling. The Defense Minerals Exploration Administration will contribute 50 percent of the cost.

Nancy Lee Mines, Inc. is well along on rehabilitation of the 3,500-foot adit at its silver-lead property near Superior, Mineral County, Montana. Next step will be sinking of a 250-foot shaft to open a known ore deposit. Directing the work is Ray Lomas, former superintendent of the now idle *Sunset Mines, Inc.* property in the Pine Creek zinc-lead district of Idaho's Coeur d'Alene mining region.

The *Anaconda Company* has shut down the *Leonard* mine at Butte, Montana, resulting in a further cut of 10 percent in the firm's copper production. This mine has been a good producer of high-grade copper ore for a number of years. The *Mt. Con* and *Kelley* are the only underground mines now producing copper in the Butte district.

The *Montana Bureau of Mines and Geology* at Butte has issued a new information circular entitled "Barite Deposits in Montana," by Victor C. DeMunck and Walter C. Ackerman. The circular contains general information on barite occurrence, its mining, treatment, and uses in the United States. Copies may be obtained free by writing to the Bureau in care of the Montana School of Mines at Butte.

WASHINGTON

Open-pit mining operations have been started at the Spokane Indian Reservation property of *Northwest Uranium Mines, Inc.* by *Silver Buckle Mining Company* of Wallace, Idaho. *Conex, Inc.*, of Portland, Oregon is the contractor. An estimated 200,000 tons of material assays 0.20 percent or better uranium oxide, according to Dr. F. S. Scott of Wallace, Idaho, who is president of Silver Buckle.

W. H. West of Deer Park and Ronald Fraser of Spokane have subleased the *Lehmbecker* property in the Mount Spokane District of northern Spokane County, Washington from *North Star Uranium, Inc.* At last report, they had stockpiled about 100 tons of autunite ore. North Star previously made four shipments from narrow seams of high-grade.

Dawn Mining Company milled 99,027 tons of uranium ore in the first seven months of full-scale operations in southwestern Stevens County, Washington. The ore was mined from the *Midnite* discovery mine in the Spokane Indian Reservation and the adjoining *Boyd* lease. Dawn is 51 percent owned by *Newmont Mining Corporation* of New York, and 49 per cent owned by *Midnite Mines, Inc.* of Wellpinit, Washington.

Spokane National Mines has resumed work at uranium properties acquired in the merging of *Dahl Uranium, Big Smoke Uranium*, and *Universal Mining* companies last winter. *K & P Construction Company* has a contract for stripping overburden from a drilled ore body at the *Dahl* lease in the Mount Spokane District. Additional drilling was planned on Dahl section 13 in the Spokane Indian Reservation adjoining the Midnite mine, stripping on Big Smoke's nearby section 14, and diamond drilling on Universal's section 15 north of the reservation. George Allison of Casper, Wyoming heads Spokane National.

Daybreak Uranium undertook drilling of 30 downholes from the surface of its Mount Spokane District property to obtain information for proper underground development of its main ore zone. The holes were to go to depths of up to 180 feet. An 1,100-ton ore shipment was made recently. Kae Sowers of Opportunity, Washington is secretary.

Development work has been resumed at the *Kromona* mine in the Sultan Basin District, Snohomish County, Washington, by the new owner, *Victory Mines Corporation*. Victory Mines acquired all assets of *Kromona Mines Corporation*, including a 100-ton flotation mill, following liquidation of the Kromona firm last fall. The management is investigating the recovery of molybdenum from the copper-gold-silver ore. W. H. Richelson, Seattle, is consulting mining engineer. J. F. Brand, Yakima, is president, and Joe F. Krom, Seatttle, vice president and general manager.

Exploration of a copper deposit on the *Mint* or *Iowa* claim in Shokomish County's Sultan Basin mining district, Washington, has been undertaken by Robert T. Curtiss of Monroe. He has been granted a 50 percent loan by the *Defense Minerals Exploration Administration;* the contract is for $11,620. Drifting, crosscutting, and long-hole drilling are planned.

Wilbur Parkin, of Centralia, Washington is building a plant near Tenino for the manufacture of expanded shale for lightweight concrete aggregate. The raw material was discovered nearby by Parkin last year.

Northwest Uranium Association has been organized by Republic and Spokane men to work for additional uranium milling and marketing facilities in northeastern Washington. The organization is gathering data on acreage under lease and development, funds spent for prospecting and development work to date, and on potential ore reserves. Sponsors contend that *Dawn Mining Company's* 440-ton uranium processing plant at Ford, Stevens County, is not large enough or versatile enough to meet the needs of the region's uranium miners. Harwood J. Tibbits, Spokane, was elected first chairman.

Additional development is planned by *Sunny Peak Mining Company* at its *Mohawk* and *Mineral Hill* silver-lead-copper properties in Okanogan County's Conconully district of Washington.

Day Mines, Inc., Wallace, Idaho lead-zinc producer, is making a geological survey of its extensive holdings in the Republic gold area, Ferry County, Washington, to determine whether company operations are warranted. Shenon & Full, Salt Lake City consulting geologists, are doing the work. The move was prompted by the great improvement of ore grade and tonnages on the new 9th and 10th levels of the firm's *Gold Dollar* mine, operated under lease by *Knob Hill Mines, Inc.*, from Knob Hill workings. Reserves of gold-silver ore have been tripled by the development work. Wray D. Farmin, Spokane, is vice president of Day Mines.

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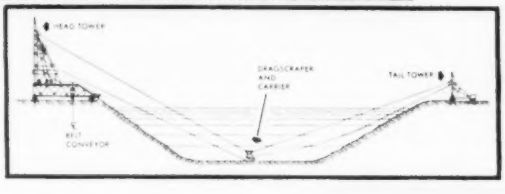

Drawing shows typical mobile tower excavator digging in wet pit.

75 Ft. Under Water... 800-Ft. Span

A 5-yd. rapid-shifting DragScraper supplies about 200 yds. per hr. to the plant hopper in background. Bridle tower in foreground is one of two supporting the bridle shifting cable which is controlled by the third drum of the Sauerman hoist. Lateral shifting of the DragScraper's line of operation is readily accomplished by power-shifting the trolley and tail block to a new position on the bridle cable. The DragScraper is digging 75 ft. under water and the operating span is 800 ft. from head frame to the bridle towers. Over a million tons have been excavated from this pit. The DragScraper often operates 24 hrs. a day to handle contract demands.

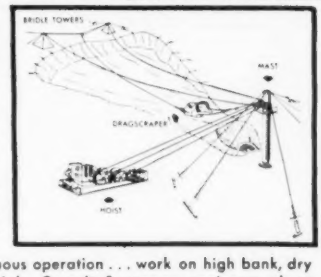

Diagram shows details of Sauerman rapid-shifting DragScraper.

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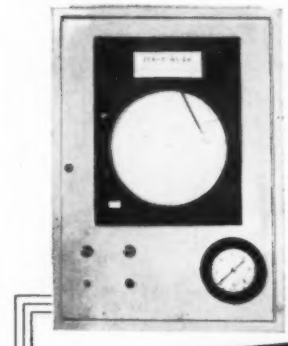

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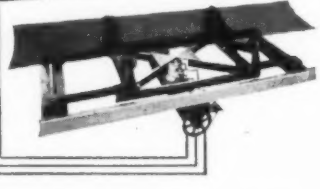

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Marcy-Shenandoah Corporation is preparing to reopen the Central Mill at Silverton, Colorado. A large tonnage of broken ore is reported to be on hand at the *Old Hundred*, ready for milling. Tailings from the Silver Lake will probably be processed after equipment has been installed for moving the material from the lake to the mill. There will also be custom milling from neighboring mines, and some ore remains in the old *Shenandoah Dives* mine itself. The plant contains some of the most modern selective flotation equipment and is capable of milling up to nearly 1,000 tons in 24 hours.

Union Oil Company has decided to close its $9,000,000 oil shale pilot plant at Grand Valley, Colorado after three years of operation. The *U.S. Bureau of Mines* indicates that it may now reopen its demonstration shale plant at Rifle, since it did not want to operate in competition with private industry in the same area.

Estes Park Beryllium Corporation is the newest to announce plans for a beryllium processing plant in the area near Loveland, Colorado. This firm plans a 200-ton-per-day operation near Drake in conjunction with *Cordillera Mining Company*. They also will jointly operate 47 claims in the Crystal Mountain area, including the *Hyatt* mine. Others in the same general vicinity are *American Beryl Corporation* which has recently started production at Masonville, and *Mineral Concentrates & Chemical Company Inc.* which has dedicated its new $250,000 plant at Loveland.

Clyde Long, operating the *Long* uranium mine at Elk Park near Silverton, Colorado, reports that good progress is being made in driving a 450-foot development tunnel. A trial shipment of 15 tons of ore has been sent to Gunnison for tests. The project is a joint operation of Mr. Long and *Gaddis Mining Company*.

Emperius Mining Company, which has operated steadily at Creede, Colorado for the past 25 years, has announced its forced closing of the mine and mill because of the depressed prices for lead and zinc. According to Ty Poxson, president, reopening "will depend upon Washington."

Kerr-McGee Oil Industries' metallurgical research section in Denver, Colorado has moved to new and larger quarters in an area located between Denver and Golden. The lab is now adjacent to the pilot plant which for the past year has been testing processes applicable to the milling of uranium ores from properties of *Kermac Nuclear Fuels Corporation* in New Mexico.

Uranium Reduction Company plans a $2,500,000 expansion of its uranium mill at Moab, Utah. The change involves the addition of an alkaline leach circuit for treatment of high lime ores from the Big Indian mining district. The present process will continue to be used for ores having lower lime content. The proposed conversion depends upon outcome of negotiations with the *Atomic Energy Commission* for sale of uranium concentrates by Uranium Reduction to the Commission after 1962. Since start of operations, the mill had been processing at about 2,800 to 3,000 tons of ore daily. This has now been reduced to 1,400 to 1,500 tons daily since July 1, in compliance with the terms of the original AEC contract.

With the aid of a DMEA contract, *Royal Corporation* of Salt Lake City, Utah plans to explore its uranium properties in the Indian Creek district of San Juan County. Drilling is to be undertaken by *Sprague & Henwood Inc.* starting around October 1. Consulting Geologists are Eakland & Osterstock of Salt Lake City. Drilling depths are expected to average 85 feet to contact the underlying Moenkopi formation. The contract with the DMEA calls for a minimum of 179 and a maximum of 529 drill holes, with a budget of $15,424.25 and $45,466.00, respectively. Before the mine closed in November 1956, it had produced 20,889 tons of uranium ore valued at $594,215, including haulage allowances.

New Park Mining Company has received a $715,185 DMEA loan to aid the company in exploration for lead-silver-zinc-gold ores in its *Mayflower* mine in the Park City district of Utah. The company has encountered some bedded ore on the 800-foot level and the new program will explore for this mineralization at greater depth.

After nearly 50 years of activity, the *Utah Ore Sampling Company* at Murray, Utah has closed its operation. The company stated it had not been receiving more than a car or two per week of custom ore sampling business from nonferrous metal mines in recent months. The loss was attributed to the shutdown of mining operations in the western states.

Radium King Mines, Inc. is reported to be merging into *Hidden Splendor Mining Company*. The announcement was made by J. A. Minton, chairman of *English Oil Company* which controls about 22.7 percent of Radium King. *Atlas Corporation*, parent company of Hidden Splendor, already owns an interest in Radium King.

Bear Creek Mining Company is extending a westerly crosscut 2,000 feet in seeking intersection of the Eureka Standard fault. Objective is commercial nonferrous metals, and oxidized mineralization has already been encountered in the brecciated Ophir limes and a shale section. The project is located in the Tintic district of Utah where the firm has sunk a 1,080-foot exploration shaft in a multimillion dollar project with *Chief Consolidated, Tintic Standard*, and other mining companies in the area.

United States Smelting Refining and Mining Company has discontinued lead smelting operations at its Midvale, Utah smelter because of the present depressed condition of the lead and zinc market. The company will continue to purchase lead smelting ores, lead and zinc concentrates, and other smelting products in the open market as in the past, as well as lead-zinc concentrating ores for its Midvale flotation mill. Arrangements have been made to smelt the lead ores, concentrates, and other lead smelting products produced by the company from its own mines and plants, as well as those purchased on open market, on a toll basis by *International Smelting and Refining Company* at it Tooele smelter.

Columbia-Geneva Division of *United States Steel Corporation* has notified *Wyoming Mica & Metals Corporation* of Lander, Wyoming that it will exercise an option to buy claims on 1,120 acres of land in the Shoshone National Forest area near Atlantic City, Wyoming for which the steel firm had traded property in the Medicine Bow National Forest several months ago. The option on the claims was made before the swap was consummated on the forest service lands. Columbia-Geneva Division reportedly agreed to pay Wyoming Mica and Metals $20,000, plus a royalty on iron ore, gold, and mica as they are mined. Jim Wade is president of Wyoming Mica & Metals Corporation. Columbia-Geneva Division also bought a 20-acre claim from the Melvin Freeburghs and the Lonnie Martins for an indicated price of $20,000. The claim is the *Lone Star* mining claim which has been in the Freeburgh-Martin families' possession since the late 1880's.

P-C Mining Corporation has reported discovery of an ore body near the *Fannie Mae* uranium mine in the East Gas Hills of Wyoming. According to vice president and general manager John Cummings, the late discoveries are shallower than formerly drilled bodies, lying between 50 and 100 feet. Ore extending over a horizontal distance of 1,500 feet has been drilled.

Shoni Uranium Corporation's president, Vern Hughes, has announced that the main ore body of the *Bonanza* mine at Copper Mountain in Wyoming has been nearly stripped. When completed, approximately 30,000 tons of ore will have been stockpiled this summer. The firm has also reactivated the *Cheyenne* mine on Beaver Rim southwest of the Gas Hills.

Thirteen carloads of uranium ore, mined through a 740-foot inclined shaft, have been shipped from the properties at Little Mountain near Lovell, Wyoming by the *Modern Mines Development Company* to the buying station at Riverton operated by *Fremont Minerals, Inc.* Modern Mines Development has the largest Atomic Energy Commission allocation for shipment of ores from the Pryor-Little Mountain area of northern Wyoming.

Western Nuclear Corporation purchased the interests of five Lander, Wyoming couples in the *Bullrush* lode and placer claims in the Gas Hills area. The firm also obtained the *Day* claims from Sam and Bettie Day of Fort Collins and the *Loma* claims from the *Loma Uranium Corporation*.

Split Rock Mining and Exploration Company has leased 29 uranium claims in the Crooks Gap area of Wyoming to K. C. Heald of Fort Worth, Texas, and to the *Crooks Gap Mining Company*.

"FLEXIBILITY AND LOW UPKEEP COSTS MAKE FLYGT PUMPS AN ADVANTAGE,"

reports LUCKY FRIDAY SILVER-LEAD MINES CO.
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While working a 750' shaft-deepening project from the 2300 to 3050 foot level, the Lucky Friday Mine ran into a dewatering problem which required pumping out an average of 150 to 175 GPM. At the start of sinking operations, air pumps were used, but because of periodic extra volume water seepage and excessive repair and maintenance costs, the air pumps were abandoned in favor of Flygt Model B-80L Submersible Electric Pumps.

In the pumping cycle, a Flygt Pump was lowered to the shaft bottom as soon after each blast as possible, and the water was lifted to relay pumps at a higher level, with heads up to 80 feet. The Mine Engineer, in a paper on the operation delivered before the Northwest Mining Convention, said of the Flygt pumping method: "Although the initial cost seemed high at first, the absence of expensive upkeep and the efficient pumping performance justified the investment. The quiet operation of the Flygt was a decided relief after listening to the siren-like air pumps. The Flygt Electric Pump was a distinct improvement over any type of air pump where large volumes of water had to be moved from the shaft bottom. It was low in upkeep cost and its unusual flexibility made it a definite advantage."

Since shaft sinking was completed, two Flygt Model B-80L Pumps now have become a part of the Lucky Friday's permanent mine pumping installation. In service since October 1956, they still are performing with a maximum of efficiency and a minimum of upkeep.

Flygt centrifugal Pumps range in size from 1½"-85 GPM capacity to 8"-3,000 GPM capacity. Head capacities range up to 210 feet. Weights range from 80 to 1200 pounds.

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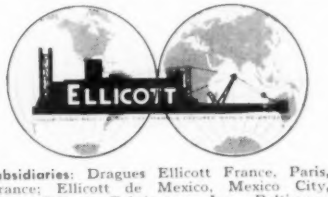

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precipitates—CENTRAL AND EASTERN

Bear Creek Mining Company, Kennecott Copper Corporation's exploration subsidiary, and *American Metal-Climax Inc.* are seeking copper mining leases in the Porcupine Mountains State Park on the south shore of Lake Superior, 20 miles west of Ontonagon, Michigan. Together, the two firms control mineral rights in 69 percent of the park, and have asked the *State Conservation Commission* for permission to mine ore on the remaining 31 percent. Most of the low-grade ore would be mined from under Lake Superior. Opposed to the operation are such conservation groups as the *Michigan United Conservation Clubs, Michigan Audubon Society,* the *Detroit Sportsmen's Congress, and Michigan Botanical Club,* who feel the project would destroy the unspoiled wilderness area. A decision by the Commission has been postponed until September.

The *Arkansas Division* of the *Magnet Cove Barium Corporation* has reopened the Malvern, Arkansas plant and mines for "very limited operations." Work at this project was suspended in March except for some testing and experimental activity because of a slowdown in demand for barite.

Omar Austin of Elizabethtown, Illinois has rented the flotation mill of *Rosiclare Lead and Fluorspar Mining Company* for the production of acid-grade fluorspar. This mill has been inactive since 1954. Mr. Austin expects to start milling shortly, using crude ore fluorspar mined from two tracts of the *Interstate* property in Hardin County, owned by Rosiclare, which Mr. Austin has under royalty leases from the mining company.

Ormet Corporation's new $55,000,000 alumina plant at Burnside, Louisiana has started initial alumina production. Full-scale output is scheduled for late summer. The firm's second production facility, a $110,000,000 aluminum reduction plant near Clarington, Ohio, is already in production. Ormet is owned jointly by *Olin Mathieson Chemical Corporation* and *Revere Copper and Brass Inc.* An assured supply of high-grade bauxite will come from Surinam under a long-term contract.

The *University of Minnesota,* in conjunction with the *Colorado School of Mines* and *Pennsylvania State University,* will hold the Eighth Annual Drilling and Blasting Symposium on its campus from October 2 through 4. Main topics to be discussed will include: recent developments in drilling and blasting practices; problems associated with use of drilling rods; drilling and blasting research. For details, write to Center for Continuation Study, University of Minnesota, Minneapolis 14, Minnesota.

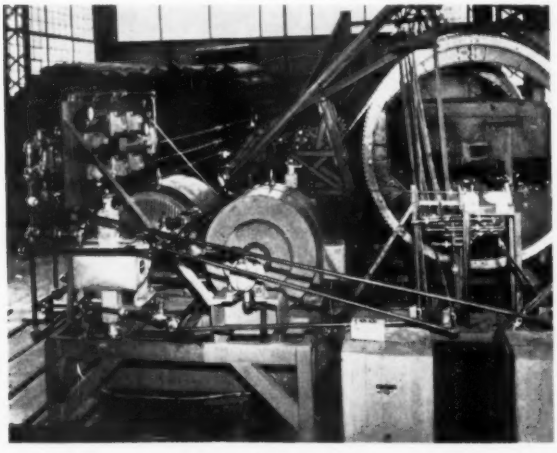
St. Joseph Lead Company has closed down its *Mine La Motte* operations near Fredericktown, Missouri, except for development work at No. 26 shaft, and pumping of mine water of No. 18. This action was taken because of the depressed conditions in the lead industry, and the company's growing stockpile. The company had closed its *Hayden Creek* operation and *Desloge* mill earlier this summer, placed the *Bonne Terre* on two shifts instead of three, and ceased all chat hauling operations.

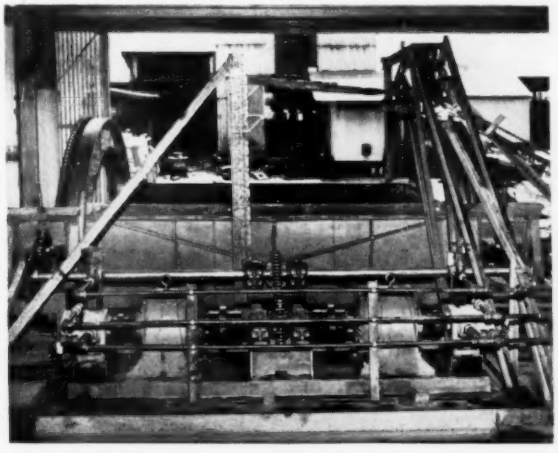
Eagle-Picher Company has closed its Central mill at Cardin, Oklahoma indefinitely. This is the third work suspension for Eagle-Picher in 15 months, caused by depressed market conditions and increasing inventories. The Galena smelter closed down for a two-week vacation period in July but was not part of the company's curtailment program.

International Minerals & Chemical Corporation has moved its administrative headquarters to a new 20-acre wooded site in suburban Skokie, Illinois, 17 miles from Chicago. This will be the new address of all divisions of the company.

New Jersey Zinc Company is beginning a $106,000 diamond drilling program in Hancock County, Tennessee. $53,000 of this amount was furnished by a DMEA loan to prospect for zinc.

Roland F. Beers Inc. has received a $71,000 DMEA loan to explore for nickel-cobalt ore in several areas in Maine. Roland F. Beers Inc. are special-





Alabama Mine Uses New Hydraulically Powered Rotary Mine Car Dumper

A new type hydraulically powered rotary mine car dumper is in operation at one of the mines of Tennessee Coal and Iron Division of United States Steel Corporation near Birmingham, Alabama. The Birmingham Fabricating Company of Birmingham, Alabama, developed this hydraulically operated and controlled dumper in cooperation with Denison Engineering Division, American Brake Shoe Company, Columbus, Ohio. The hydraulic dumper is designed to handle the dumping of a train of mine cars without uncoupling any car in the train. The photographs show the dumper assembled in the shop for testing.

Two individual hydraulic systems power the dumper through its operating cycle. Rotation is initiated by a four-way valve which first releases the alignment cylinder, which controls the basic position on the dump. When this cylinder is retracted from the locating hole, the operator starts the rotation. Speed of rotation is controlled by governing the amount of hydraulic flow directed to two Denison TMC-2-B cylinder-controlled, vane-type pumps. These Denison pumps in turn control the rotating speed of two main fluid motors which roll over the dump through a chain and sprocket drive.

The two Denison fluid motors have a gear reduction ratio output of 9.3:1.0. The chain drive reduction ratio is 8.4:10. The overall power ratio is 78.5:10. Two, 5,000-pound-per-square-inch, Denison, axial piston hydraulic pumps are each driven by a 25-horsepower electric motor. In addition, there are two Denison TMC vane-type pumps driven by individual 20-horsepower electric motors to supply power take-off for the main fluid motors to move the cars in position. Either of the two hydraulic systems can operate this dumper unit to assure peak dependability and availability.

The hydraulically operated dump can be completely stalled without harming the drive motors. The unit can also be reversed immediately, stopped, or started in any operative position without damage to any part of the system.

This dual power system means maintenance is relatively simple. While one hydraulic circuit operates the unit, the other system can be serviced.

ists in use of modern geophysical methods for locating mineral deposits. They have been working in Maine for the past year on behalf of a syndicate formed to locate sulphide ore bodies by the use of recently invented airborne electromagnetic instruments. *Basic Incorporated* is the chief participant.

Michigan Chemical Corporation will proceed with plans for construction of a new seawater magnesia plant at Port St. Joe, Florida which will enlarge many times the company's present natural brine facility at St. Louis, Michigan. The new plant will have a design capacity of 125 to 150 tons a day and a subsequent enlargement to 300 tons. It will produce high purity chemical and refractory grades of magnesium oxide.

New management of the *Nipissing Mines Company* has brought certain changes to the company's mining policies. The *Elizabeth* copper mine in Vermont, where operations were terminated last year when the deposit was depleted, will be liquidated, and similar action is to be taken with the low-grade *Croton* iron ore property in New York state. *Nipissing-O'Brien Mines*, in which Nipissing holds a 55 percent interest, is already being liquidated. The *Ore Knob* copper mine by the wholly owned subsidiary, *Appalachian Sulphides Ltd.*, will continue in operation with a new development program being undertaken to increase reserves. The shaft is being deepened to 150 or 175 feet below the present bottom of 980 feet.

New Jersey Zinc Company has curtailed its eastern mining operations. The newly opened *Ivanhoe* mine at Ivanhoe, Virginia was shut down in July, and operations will be reduced at the Austinville, Virginia mine where work will be cut to a four-day week. Development work at the new *Flat Gap* mine at Treadway, Tennessee, has been suspended. The cutbacks were made because of a continuing oversupply of zinc.

United States Steel Corporation has opened a new ore sintering plant at Youngstown, Ohio. The new plant is capable of processing 5,000 tons of domestic and foreign ore daily for the Youngstown operation's five blast furnaces.

International Minerals and Chemical Corporation has gone into full-scale production of flake mica at Davy Crockett Lake near Greeneville, Tennessee. The company's plant has been increased from a pilot plant operation of 24 tons daily to full capacity of 120 tons daily. The plant's source of supply is a deposit of mica-bearing silt that had been accumulating for over 50 years in a five-mile delta in the Davy Crockett Lake, six miles upstream from the TVA Nolichucky Dam. It is estimated to be over 40 feet thick in places, and to contain more than 500,000 tons of commercial mica.

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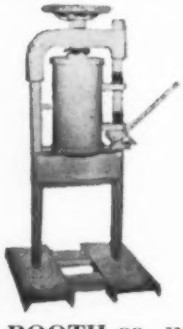

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IRON RANGES

Pickands Mather & Co. has placed its new *Danube* jig plant in operation at Bovey, Minnesota. The new plant, which was constructed during the winter of 1957-58, will produce fine concentrates from lean ore stockpiles. The company has also started its *Mahomen* mine at Crosby, this season.

Seasonal iron ore shipments from the Lake Superior area continued to lag in June, compared with similar dates in 1957. Steel cutbacks have dictated the reduction. June shipments were 8,040,793 tons, compared with 13,597,376 tons in June a year ago. Total for the season to July 1 was 12,163,964 tons in 1958, compared with 40,311,649 tons a year ago.

Jones & Laughlin Steel Corporation has stepped up production at the *Hill Annex* mine by going on a 17-shift-per-week basis from a 15-shift-per-week basis.

Dings Magnetic Separator Company will test a new method of using electricity to separate iron ore. The extensive testing program will be conducted in Milwaukee to determine the possibilities for use in beneficiation of nonmagnetic taconite. Dings has acquired the sale and manufacturing rights to the nonmagnetic separator from *Quaker Oats Company*.

Linde Company's new oxygen producing plant to supply the taconite open-pit mines in Minnesota is now on-stream. It is capable of producing 65 tons of oxygen daily. Located on leased property, it was built and will be operated and maintained by Linde, a division of *Union Carbide Corporation*. The oxygen will be used for jet piercing operations.

Mining Speakers Arranged For San Francisco Show

John D. Bradley, president of the Bunker Hill Company and chairman of the Western Division of the American Mining Congress, and Frank Coolbaugh, vice president of American Metal Climax, Inc. and national program chairman, have already secured commitments from a number of leading operators to speak at the forthcoming San Francisco Metal Mining Show and Exposition. San Francisco, California will play host to the Exposition at the new Brooks Hall from September 22 through 25th.

Among those who are scheduled to speak and their subjects are: W. H. Love, manager of mines, and Philip Lindstrom, Radon mine superintendent, Hecla Mining Company, "Longwall Mining at Radon Uranium Mine at Big Indian, Utah"; Harlow Hardinge, president, The Hardinge Company, "Autogenous Grinding"; R. W. Braund, general manager Michigan mines, Jones & Laughlin Steel Corporation, "How To Use Metal Liners In Ore Passes"; W. F. Shinners, manager Michigan mines, M. A. Hanna Company, "Why The Circular Shaft?"; Dr. R. D. Bennett, manager, General Electric Vallecitas, California Atomic Laboratory, "The Future of Atomic Energy"; Staff of International Nickel Company of Canada, Ltd., "Exploration and Development of Inco's New Manitoba Nickel Deposits."

A wide variety of other papers are planned for this meeting.

Southwestern Iron and Steel Industries, Inc., of Tucson, Arizona is reported to have acquired all interests of *Garpac, Inc.*, the *Omega Mining and Exploration Company*, and the *Black Hills Company* in the *Omega* iron placer deposit, northwest of Tucson, Arizona. The new organization, according to John W. Martin, president, is operating a magnetic separation pilot plant, making assays of the concentrates recovered, and testing mill recovery. Joe Linn of Henderson, Nevada has been employed as a chemist to run the mill tests. The plant consists principally of two magnetic drums, an impact crusher, and a Stearns electromagnetic separator, all connected by conveyor belts. Future operations are covered by a contract with *W. R. Skousen Company* of Phoenix and Tempe for mining and concentrating the placer sand and hauling concentrates to Red Rock. A magnetic separation plant with a capacity of 200 tons of concentrates per hour is said to be planned if pilot testing is successful.

Basic Minerals, Inc., Phoenix, Arizona is operating the old Rattlesnake mill, a small crushing and retorting plant, in the Sunflower district. Current mercury ore supply is coming from the *Bernice* claims, operated under lease by Bronson and Grimes. The plant can handle from 20 to 30 tons of ore per day with a three-man crew. Basic Minerals also is conducting some exploration and development work on leased claims in the area.

The *Bemco Mining Company* of Los Angeles is actively developing its *Sun Valley* uranium claims in the Marble Canyon area of Coconino County, Arizona. A 250-foot drift is being run on the 45-foot level of a recently completed shaft and is two-thirds completed. A crew of five men is employed under the direction of Phillip H. McCrary, manager, and Ralph Haines, superintendent.

The *Jaquays Mining Corporation*, at Globe, Arizona has just completed the construction of a new steel ore bin at the portal of the Navajo drift at the *Regal* asbestos mine. Since the first of the year, the company has done about 800 feet of drifting in developing the new production area. Jaquays is said to be investigating possible locations and facilities for the construction of a new mill east of Globe. Alvin W. Gerhardt is general superintendent.

Miami Copper Company, Miami, Arizona, reports that on June 15 an outstanding record for rotary blast hole drilling was achieved at its *Copper Cities Division*. Pascual De La Paz, drill operator, and E. D. Alexander, drill helper, drilled a total of 1,430 feet in one shift. In compiling this footage, 26 holes were drilled, each 9 inches in diameter and 55 feet deep. These blast holes are charged with dynamite and detonated to provide broken ore for the electric shovels.

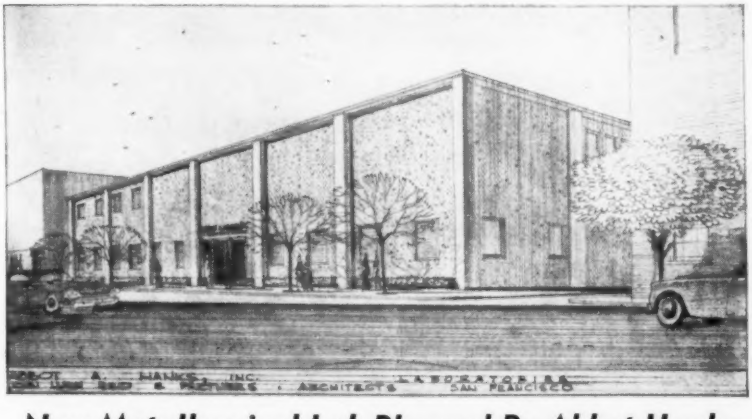
The partnership of *Brown and Robinnette* is constructing a new crushing and jigging plant three-quarters of a mile south of Brown's Crossing, Arizona, to handle the manganese production from the *Price and Priceless* group of claims in the Artillery Peak area. The plant will have an estimated maximum capacity of 700 tons per day, and is expected to handle an average of 500 tons per day. As soon as the mill is in production, the operators plan a drilling program to block out additional reserves in and around the present pit. Present plans do not include any provision for accepting custom ores at the mill.

Production from the *Doughboy* mine at Globe, Arizona, has been running about 100 tons per week of 32 to 35 percent manganese ore. Shipments so far have gone to the *Mohave Mining and Milling Company's* plant at Wickenburg on the batch basis of 600 tons minimum. Operators of the mine are Russell Wright, Phoenix; W. W. Sorsen, Globe; and H. C. Smith, Globe.

Five men are employed at the *Wolfe-Olsen* lease at the *Globe* manganese mine, owned by Tony Kimball of Silver City, New Mexico. In the last three months, 150 tons of ore have been shipped to *Mohave Mining and Milling Company* for up-grading and marketing under the carlot program. Present production is coming from the 120-foot level. Erwin Wolfe of Claypool, Arizona is in charge.

Eleven men, working two shifts, are employed at the *McCracken* mine and mill in the Signal area of Mohave County, Arizona. Recently, the principal work has been runing test batches from the mine and dumps in the company's 30-ton mill. This plant consists of two jaw crushers, a six-inch conical ball mill, rake classifier, six flotation cells, and four tables. Mill heads are said to have run from 6 to 16 percent lead and 4 to 25 ounces silver. Robert L. Hockett, Signal, is mill foreman.

Ore Concentrates, Inc., Bouse, Arizona, reportedly has entered into an agreement with *Sunshine Mining Company* of Spokane, Washington, whereby the latter concern will revamp the manganese plant at Bouse and manage the operation. The company holds the *Black Bird* group of eight unpatented claims two miles east of Bouse, which has shipped a considerable tonnage of low-grade manganese ore, and the *Black Hills* group four miles to the south. Both properties are owned by Jim Townsend of Bouse. At the Black Bird, workings consist of two pits and some surface cuts and trenches. Currently, 10 men are employed in rehabilitation and expansion of the mill to 600 to 800



New Metallurgical Lab Planned By Abbot Hanks

Ground has been broken for the new laboratory planned by Abbot A. Hanks, Inc. in San Francisco, California. The building, which will cover 20,000 square feet, is expected to be ready for occupancy by November 1958. John Lyon Reid & Partners are the architects and engineers; Elvin C. Stendell is the contractor. The laboratory, as shown in the artist's conception above, will be a two-story, reinforced concrete structure housing facilities for laboratory and testing services in connection with structural materials, soil mechanics, chemical, metallurgical, spectrographic, and assay work. The laboratory of Abbot A. Hanks, Inc. was established 92 years ago by Henry G. Hanks, the first California State minerologist, and is the oldest laboratory of its kind in the United States to maintain continuous operation during this entire period. Herbert D. Imrie is president of the corporation and Theodore P. Dresser, Jr. is vice president and engineer.

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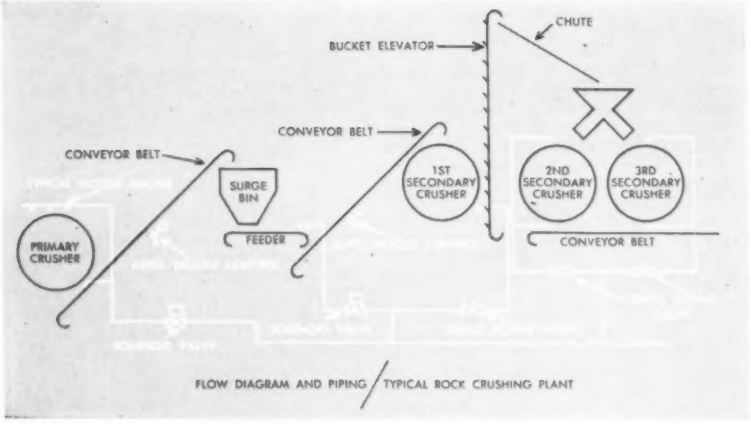

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tons per day. *Isbell Construction Company*, the exploration and mining contractor, has a two-man crew drilling in and around the east pit. Pat Williams, Bouse is manager; Imo Ito, mill superintendent.

Mohave Mining and Milling Company, Wickenburg, Arizona, is employing 12 men at its manganese mill on the Hassayampa River, four miles north of Wickenburg, and 14 men at the sintering plant. The milling plant is handling about 200 tons per day and the sintering plant 100 tons per day. From one-half to two-thirds of the total tonnage is custom ore, principally from the Globe area. The company's own production comes from the *Magnet* mine near Globe. This property is developed by a 150-foot shaft with the main level at 100 feet. Drifts have been run 125 feet in both directions on the vein, and some stoping is in progress above both drifts. The rate of production ranges from 75 to 150 tons per day. The ore is hoisted by means of a Chrysler Industrial single-drum hoist using a ⅝-inch cable, then dumped onto the stockpile. Later, it is loaded by a ¾-yard TD9 Trackscavator into 22-yard semi-trailer trucks and hauled 145 miles to Wickenburg. The trucking contract is held by Wells Cargo Company. Mining operations employ nine men underground and four at the surface. Company officials at Wickenburg include W. R. Easley, general manager; George Johnson, mill superintendent; and Bob Monahan, sinter plant superintendent.

Ray Mines Division of Kennecott Copper Corporation, Ray, Arizona, shut down its operations from Saturday, June 28, through Monday, July 14, to allow a vacation period for employes, according to General Manager A. P. Morris. Operations resumed on July 15. Morris stated that construction of Kennecott's new Hayden smelter and furnace run-in on the smelter continued through the vacation period. In addition, the precipitating plant at Ray continued normal operation.

The *Arizona Asbestos Company* of Phoenix, Arizona is undertaking a drilling program at its mines near Young, Arizona, to establish a firm ore reserve. The DMEA is participating to the extent of $7,260. Drilling completed to date indicates the firm will substantially improve its reserves through this new drilling. Faye Hanson is manager of the company, and Cleland N. Conwell is engineer and geologist in charge of exploration.

Destruction by fire of a *Southern Pacific Railroad* bridge on the line serving *Inspiration Consolidated Copper Company's* plant at Inspiration, Arizona, halted movement of incoming supplies and outbound copper for about three weeks. During that time, Inspiration shut down its mine and plant and scheduled all pending vacations. The shutdown, and subsequent loss in production, deferred from July 1 to October 1 the start of a planned shortened work-week which will reduce copper output by a further 10 percent.

Banner Mining Company is reported to be negotiating with *Pima Mining Company* which is developing on open pit near the edge of Banner's property line in the Twin Buttes copper district of Arizona. Banner is currently operating its *Daisy* underground mine near the boundary and is seeking provisions for compensation from Pima if the latter should damage the Daisy operations in extending its own open pit.

Perlite Industries of Arizona, Inc. is shipping an average of four cars of ore

per week from its *Adams* perlite mine and mill near Superior, Arizona. The shipments go to Texas where the material is used in filters. The company maintains offices in Phoenix; Lewis Williams is president, and Buster Williams is treasurer.

The Interior Department awarded a contract for 3,000,000 barrels of Portland cement for the Glen Canyon Dam on the Colorado River in Arizona to *American Cement Corporation* on its low bid of $3.2473 a barrel. The cement is to be supplied from a new mill to be constructed at Clarkdale, Arizona by the *Riverside-Arizona Cement Company*, a newly formed division of American Cement.

Dr. and Mrs. B. S. Butler of Tucson, Arizona, have presented $15,000 to the University of Arizona to set up a scholarship fund for graduate work in geology. Earnings from the fund will provide for a $600 annual scholarship to be known as the Bert S. Butler Scholarship. Dr. Butler was head of the University's department of geology from 1931 to 1948, and previously was associated with the U. S. Geological Survey for 20 years. In 1947 he was awarded the Penrose medal by the Society of Economic Geologists.

The first in a new series of *U.S. Bureau of Mines* technical reports devoted to the use of mathematics and of statistical analysis in estimating the grade and tonnage of reserves has been released. The report is for sale at $1 a copy by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.—Bureau of Mines Report of Investigations 5375 "A Comparative Study of Statistical Analysis and Other Methods of Computing Ore Reserves, Utilizing Analytical Data from Maggie Canyon Manganese Deposit, Artillery Mountains Region, Mohave County, Arizona."

Mercury Electronics Corporation of Los Angeles, California, formerly *United Mercury Corporation*, has acquired a substantial interest in *Consolidated Sulfur Corporation* and its sulphur claims in Inyo County, California. The claims, known as the *Crater Group*, are reported to have a reserve of 1,453,000 tons of sulphur. Acquired with the property was a license for a new "Hydro Thermal" process for refining sulphur which the company intends to use. Pilot plant tests are said to have been satisfactory, and a plant is to be constructed.

B. C. Austin, president of *Castella Corporation*, reports that construction has started on a 30-ton mercury recovery plant at the *Altoona* mine in Trinity County, California. *Rare Metals Corporation of America* recently explored the property, but decided not to go ahead with development work. The Castella Corporation hopes to begin production in September.

California Quicksilver Mines Inc. has decided to sell all of its assets to *COG Mineral Corporation* of Denver, Colorado, and then will dissolve. Subject to approval by stockholders, California Quicksilver would transfer its assets in exchange for 296,000 shares of COG common stock; stockholders would receive one share in

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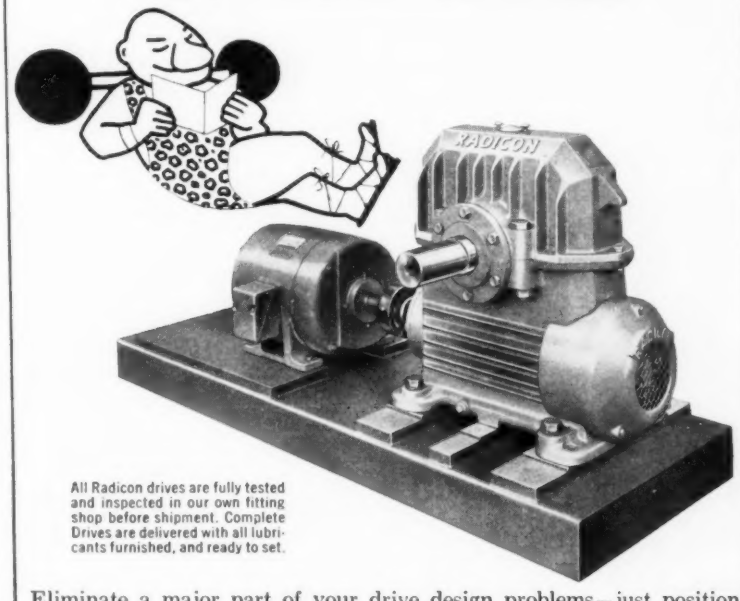

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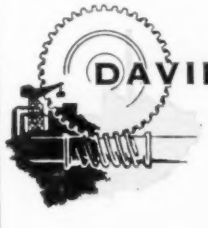

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SOUTHWEST

COG for each 6¼ shares in California Quicksilver. The latter's property is a producing mercury mine in Lake County, California. COG Minerals is producing uranium ores in Dry Canyon, Utah.

NEVADA

Manganese Inc. at Henderson, Nevada has begun stripping overburden from its "A" pit which the company had abandoned a few months ago. The firm expects to strip 1,000,000 yards of overburden and then to mine 100,000 tons of ore. This is expected to take about six months.

The old *Ohio* gold mine at Goldpoint, Nevada is being reopened by the *Ohio Mining Company*. Under a contract with the *U.S. Milling & Minerals Corporation*, the ore will be processed at the latter's mill at Silver Peak.

The *U.S. Lime Products Corporation* has completed its new $2,000,000 plant at Arrolime, Nevada, near Las Vegas. The 400-ton-per-day plant was erected in 10 months by J. H. Pomeroy & Company Inc. of San Francisco for the *Flinkote Company* subsidiary. Production of quicklime for the chemical, steel, metallurgical, water treatment, and construction industries is already under way. The limestone for the plant comes from nearby open-pit deposits.

Edgemont Mining Company, which is operating the old *Edgemont* gold mine in the Centennial district of Elko County, Nevada, has awarded a contract to *Boyles Brothers Drilling Company* for 2,000 feet of underground diamond drilling. The work will be done from a drift on the Lucky Girl vein to explore the Lucky Boy vein which is parallel. The Lucky Girl was encountered in the Burrell Adit and a drift has been driven 1,300 feet.

Nevada-Massachusetts Company has shut down its tungsten mining and milling operations in Pershing County, Nevada because of the continued low demand for tungsten, together with prices lower than the cost of production. A small crew will remain to maintain the property. Nevada-Massachusetts is the oldest tungsten producer in the United States. Ironically, the mine continued to operate during the depression of the 1930's.

NEW MEXICO

United States Potash Company expects to start mining from its northeast ore body extension near Carlsbad, New Mexico by November. A new entry is being driven to an outer extension of this previously mined ore body from a point immediately adjacent to Shaft No. 1. During the shutdown period at both the mine and refinery from June 8 to July 14, a series of repairs were made, including a limited amount of trimming up work on the Number 1 shaft in preparation for handling of ore from the northeast ore body. One

of the main projects carried out during this period was the installation of a complete new set of steel grizzly rails in the West Pocket of No. 1 shaft. Also completed was the transfer of the main booster fan in the north development about 1½ miles further north to a position where it will be able to function more favorably.

Roberts & Associates of Los Angeles, California have leased the Zinc concentrator of *Hydrometals Inc.* at Deming, New Mexico. The transaction was handled through *Peru Mining Company*, a wholly owned subsidiary of Hydrometals. The Deming has been closed for about two years. The arrangement is on a rental-purchase basis. Roberts & Associates will pay about $35,000 in rental this year; then starting in 1959, the firm will pay $7,500 a month, plus $1.00 a ton for every ton of ore treated by Roberts above a rate of 7,500 tons treated per month. Roberts also has the right to purchase the plant for $1,000,000 with all money paid until then, applied against the purchase price. Roberts & Associates are principally interested in fluorspar, and it is expected that the Deming plant will be used to treat fluorspar.

Kennecott Copper Corporation's Chino Mines Division at Hurley, New Mexico has awarded a $3,000,000 contract to the *J. F. White Engineering Corporation* of Englewood, Colorado for design and construction of a 16,500-kilowatt power plant addition. The project is expected to take 18 months to complete, and includes building a power house.

An interesting struggle for control of uranium holdings in the Ambrosia Lake area of New Mexico has been going on since the *Dysart No. 1* mine became a major producer under *Rio de Oro Uranium Mines Inc.* In the 1920's, Stella Dysart acquired leases on 150,000 acres in the area for oil development. To raise money for wildcat operations, Miss Dysart subdivided part of her holdings. Some were sold in parcels as small as 1/16 of an acre, and the purchasers came to a total of about 4,000 people, most of them Southern California residents. Since the uranium discovery, Miss Dysart has carried on the huge task of attempting to locate these owners to make arrangements for developing their holdings along with her own. Her personal holdings are not involved; she owns these lands outright and they carry 17½ per cent royalty rights under contracts with major operators, such as *Homestake-New Mexico Partners* and *Kermac Nuclear Fuels Company*. However, Frank E. Bell of Gallup is reported to be seeking these same small owners to persuade them to give development authorization to him and *Phillips Petroleum Company*.

Correction

Mr. Howard A. Meyerhoff reports that he is not and never has been employed as geologist for the Black Range Mining Company, of Kingston, New Mexico despite the report by company president J. H. Shoonmaker that he was so employed. Mr. Shoonmaker's information was the basis for the company listing in the MINING WORLD Catalogue Survey and Directory Number of April 15, 1958. MINING WORLD regrets any inconvenience to Mr. Meyerhoff.

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Thorium Recovery Plant To Be Built in Canada

Construction has begun on the first Canadian thorium recovery plant, to be built by Rio Tinto Dow Ltd. near Elliott Lake in the Blind River uranium district of Ontario. The $1,000,000 plant will be designed to produce crude thorium concentrates and refined metallurgical grade thorium sulphate and oxide from solutions presently discarded as waste from Blind River uranium recovery. Annual production of the various thorium compounds is expected to be at the rate of 100 to 200 tons. The plant is scheduled to begin operations by January 1959, and should reach capacity production by May 1959.

This plant will be the first in the world to attempt byproduct production of thorium compounds, and the operation depends entirely on continued operations of Algom Uranium Mines' Quirke Lake uranium concentrating plant, which will provide the raw material. No plans have been announced for production of any of the rare earths also present in Blind River ores.

Rio Tinto Dow was formed several months ago (See MINING WORLD, February 1958, Page 33) by Rio Tinto Mining Company of Canada Ltd. and Dow Chemical of Canada, Ltd., to produce thorium and rare earths from byproducts obtained from uranium mining in the Blind River-Algoma area. Ernest N. Banks, formerly employed by Dow Chemical in Sarnia, has been transferred to Elliott Lake as plant manager. John H. Spaulding has been appointed project engineer during the engineering and construction of the new plant.

Morocco's 2-Year Plan Calls for Foreign Capital

Encouragement of national and foreign capital investment in Morrocan mining ventures is stressed in the current 2-year Plan just announced by the government. However, investment by foreign interests will be restricted to certain sections of the country chosen by the State

The 2-year Plan will be partially financed by the nationalized phosphate industry, Office Cherifien des Phosphates (OCP), which will invest 13,000,000,000 francs. In return, the phosphate industry will be assisted in increasing production. Railroad facilities at the Khouribga phosphate mines will be improved with the addition of three new electric locomotives and 50 new aluminum freight cars. Production from Khouribga alone is expected to increase from 4,000,000 to 5,000,000 tons annually.

Prospecting activities of the Bureau de Recherches et de Participations Minieres and the OCP will also be given special attention under the government program.

Total expenditures of the Plan are estimated at 89,490,000,000 francs; predicted revenue includes 31,490,000,000 from local sources and 58,000,000,000 to come from foreign loans.

Craigmont Assigns Rights To Copper-Iron Property

Craigmont Mines Ltd. has entered an agreement with a group of operating mining companies, including Noranda Mines, Ltd., Canadian Exploration Ltd., and Peerless Oil & Gas, Inc., granting exclusive exploration rights on Craigmont's 127-claim copper-iron property in Highland Valley near Merritt, British Columbia, Canada. According to terms of the agreement, the operators will receive 60 percent of the profit and Craigmont 40 percent, after Craigmont has been reimbursed $600,000 for pre-production expenses.

The operating companies have agreed to invest $500,000 on underground development within 18 months. At the end of that time, if they wish to keep the agreement in effect, they must spend an additional $500,000 within the next 18 months. When these three years have elapsed, production must begin during the next four-year period in order for the operators to receive 60 percent of the net income.

In addition to exploration and development, studies will be made concerning the possibility of copper milling and smelting, as well as iron production. Decisions relating to initiation of copper production, capacity of copper concentrator, and mining and treatment of iron ore will be made by the operators.

As of June 1, 1958, ore reserves of the Craigmont deposit were estimated at 8,105,000 tons of probable ore averaging 1.99 percent copper and 21.7 percent iron. According to the company's consultants, Chapman, Wood & Griswold of Albuquerque, New Mexico, an additional 12,055,000 tons of possible ore of undetermined grade is indicated. (See MINING WORLD, July 1958, pages 44-46, for story of how the deposit was found.)

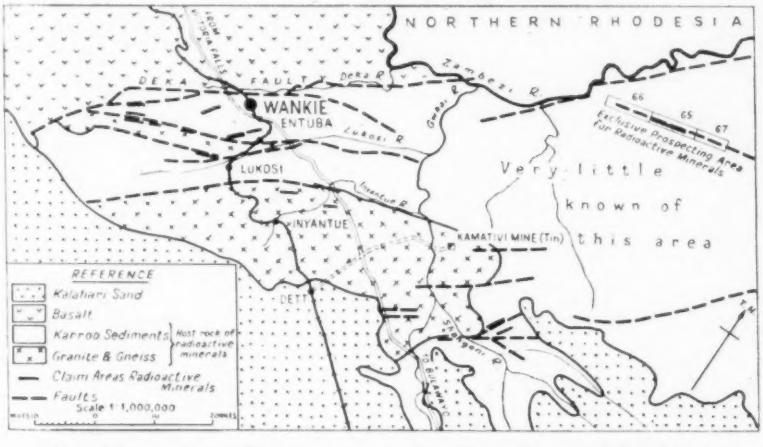
Four diamond drills are now in operation on the property, and an underground adit will be driven at the 3,500-foot level. This will facilitate diamond drilling from underground stations, and will also serve as a main haulage way if the lower limit of the ore is found near the floor of the adit, or as an upper working level if significant downward ore extensions are found.

Craigmont advises, however, that although underground development is now underway, the possibility of open pit mining has not been completely eliminated.

Italy's Largest Mercury Producer Seeks New Mine

Monte Amiata Company, largest single mercury producer in the world, recently obtained two new exploration permits from the Italian government. Totaling about 200,000 acres, the new permits cover practically the whole main Italian mercury-producing region, 100 miles north of Rome, and surround all of the former exploration permits and concessions.

Objective of the company is to find a promising deposit which would replace the old Abbadia San Salvatore mine. Although not yet exhausted, this mine is rapidly becoming a high-cost producer because of the gradual reduction in average grade and the scattered production



Radioactive Occurrence in Southern Rhodesia

In the Wankie Colliery area, in the Northwest corner of Southern Rhodesia and not far from the Victoria Falls, a number of radioactive finds has caused an extensive prospecting campaign. The value of these occurrences is as yet unknown. Dr. F. L. Amm of the Southern Rhodesia Geological Survey has published a preliminary report after reconnaissance of the area, which shows their distribution to be associated with a wide zone of N.E.-S.W. faulting, but there are also indications of bedded horizons within the Karroo sediments being sufficiently radioactive to warrant further investigation. The faults are mostly past Karroo in age, and the fault planes often marked by lines of breccia, sufficiently silicified and hard to stand up as ridges. In places, hot water springs are present along the outcrop. In the north-eastern part of the area, certain radioactive occurrences have been shown to contain thorium in association with barite. In the Wankie area the radioactive element is uranium in association with fluorspar. Knowledge of the area is not sufficient to determine whether this indicates a zonal distribution of the radioactive elements. In general the uranium content indicated averages under one pound per ton, although isolated hot spots have given considerably higher figures. This is the result of only random outcrop sampling and based on radiometric readings. The extent of the outcrop leaching, and the grade of the primary ore in the unweathered rock, has yet to be determined by exploration in depth. Until this is done, it will not be known whether the field has any promise for economic development. The new mineral field is of approximately 4,000 square miles in extent, but served by few roads. The only reasonable approach to examination of such a large area will be by airborne scintillometer survey if advantage is to be taken of the price guaranteed until March 1959.

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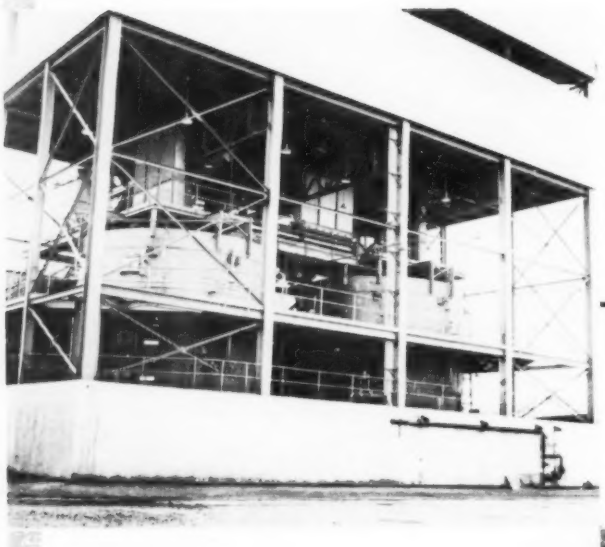
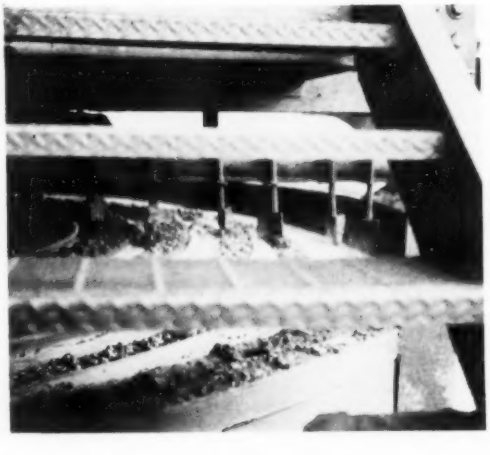


Installation in a southwestern U. S. copper company. Two 23'-6" I. D. 4-hearth Skinner Dryers. Each unit is drying over 20 tons per hour of copper sulphide concentrates from approximately 15% moisture content.

Looking into upper hearth, showing rabble arms raking concentrates into the next drying hearth.



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from many marginal ore remnants left from previous mining.

An intensive exploration program is already under way using many modern geological and geophysical tools. A new exploration department has been created within the company to supervise the project. First, the known ore bodies have been carefully restudied for a better reinterpretation of the disputed ore genesis and for a careful statement of the geological factors which controlled the ore deposition.

Following that phase, the geology of the area was studied through detailed stratigraphic reconstructions with the aid of micropaleontology; structural interpretation from aerial photographs; petrographic examinations; conventional field surveys hydrogeological interpretation, etc. For the quantitative reconstruction of the structural conditions, a broad gravimetric survey, including several hundred stations, was also made. In addition, seismic lines are being shot, and geo-electrical soundings will be added. Geochemical exploration also will be used for the location of the halos of mercury traces which may surround the ore concentrations.

A drilling program has started and some 20 holes are to be completed this summer.

The geophysical exploration is being carried on by parties of the Rome University Geophysical Institute and the Italwestern Company, a subsidiary of Western Geophysical Company of Los Angeles, California. Drilling work was contracted to Stardrill-Keystone Italiana, a subsidiary of the Stardrill-Keystone Company of Beaver Falls, Pennsylvania.

TURKEY—Two *Krupp* geologists are drilling and mapping in the Iskenderun area of southern Turkey. Sedimentary iron ore deposits have been indicated in limestone and they are working under the auspices of the Turkish government.

BURMA—During the first three months of 1958, mineral exports from the Tavoy district totaled 580.25 tons, compared with 507 in 1957. The exports from the Mergui district during the same three-month period of 1958 totaled 211.70 tons, compared with 174.10 in 1957. In both districts, production of tin concentrates increased, while wolframite concentrates decreased because of low prices and selling difficulties.

INDIA—The Government of India has decided that for the period July 1958 to June 1959, the export of manganese ore will be regulated as follows. The established shippers, the mine-owner exporters, and the *State Trading Corporation* will be given an allotment quota for a quantity equal to the quota for 1957-58. Firms and parties whose individual allotments are small are advised to form cooperatives or limited companies. In order to encourage small quota-holders to form themselves into cooperatives or limited companies, it has been decided that where the total of the individual allotments of the firms and parties joining a particular cooperative or company amounts to 25,000 tons, a bonus allotment of 10 percent of the total will be given to the company or cooperative concerned. Quota-holders

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3B	42"	1540#
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with past performance during the period 1957-58 in more than one sector will be given movement facilities pro-rated to their past performance on each sector. Exports of low-grade manganese ore from Garividi, Srikakulam, Bombilli, Salur, and Raigada areas will be licensed freely on production of foreign sales contracts and of manganese ore analyzing 40 percent and below from loading stations of Dohad, Shivrajpur, Nathpuri, and Pani in Panchmahal district of Bombay and Rajasthan State. Those who are able to secure bulk business in excess of their quotas or who are able to negotiate sales on long-term business for deliveries beyond June 1959 are advised to approach the Chief Controller of Imports and Exports in order to work out satisfactory arrangements so that, in anticipation of the export policy for succeeding years, advantage may be taken of such business opportunities.

KOREA—According to the project report for the second half of 1958, *Samsong Mining Company* plans to process 2,500 tons of ore monthly to produce 74.92 kilograms of gold, 832.65 kilograms of silver, and 86.24 tons of electrolytic copper. However, company officials say it will be impossible to balance the budget without a government subsidy of HW 70,826,550. To ease the operational difficulties of Samsong Mining, the Mining Bureau of the Ministry of Commerce & Industry has recommended these measures: exportation of copper ore will be approved on a limited basis; HW 600,000,000 will be loaned to the company for the purchases of ore; the firm's lead refinery will be renovated. The company has a debt of HW 150,000,000 and unless these measures are taken, the operation of the 100-ton furnace will have to be suspended.

MALAYA—The Federation's tin quota for the third quarter from July 1 to September 30 under the *International Tin Agreement* is 192,686 piculs of tin concentrates, or 8,625 tons. However, to correct for overfill and to provide for contingencies, this amount has been reduced to 186,000 piculs. The allotment is as follows: European producers 109,108 piculs; Asian producers 73,563 piculs; dulang producers 3,329 piculs. The new quota represents 58.19 percent of the 1957 quarterly average production of 14,823 tons metal content. There is strong feeling about the uncontrolled Russian exports of tin into Western European markets. These exports are now reaching such a volume that they are depressing world price and threatening the Asian tin producer with a serious labor and economic crisis. Malaya is the world's leading tin producer.

KOREA—The *Korea Tungsten Mining Company* has been advised by the *Mining Bureau* of the *Ministry of Commerce* to step up its efforts to complete construction of its chemical processing plant. Korea Tungsten, which has been suffering from a lack of capital, was also instructed to take the following measures: supplies at the *Talsong* mine which are not being used should be disposed of; production should start at once at the *Yangchi-ri* mine; sales of tungsten on a consignment basis should be reported in advance of each sale; tungsten dollars should be used only within the framework of regulations for control of foreign exchange, and importing of luxury goods and goods not urgently needed should be minimized.

TURKEY—The French firm, *Societe Pechiney et Compadac*, will deliver ma-

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chinery and buildings for a ferrochrome plant which will be located near Antalya in southern Turkey. Chrome ore production in 1957 totaled 751,029 tons. The *MTA Institute* is planning to install a department for research work on chrome ore deposits.

OCEANIA

REPUBLIC OF THE PHILIPPINES—*General Base Metals* has located a deposit of shipping grade manganese ore under limestone deposits on the company's property at Bohol. The firm plans to mix these shipping grade ores with low-grade ores, and is now assured of a stockpile to meet its commitments to ship 17,500 tons of ore to the Japanese firm of *Mitsubishi Shoji Kaisha Ltd.* General Base Metals has also completed installation of a logwasher in Guindulman, Bohol, which now provides for an average of 900 to 1,000 tons monthly production.

WESTERN AUSTRALIA—*Rio Tinto Ltd.*, through its Australian subsidiaries, has been granted a reserve of 13,000 square miles mainly in the Yilgairn field for all minerals except gold and iron. (The *Koolanobbing* iron ore deposits estimated at 69,000,000 tons, and the *Bungalbin* and *Mount Welton* iron ore prospects, estimated at 44,000,000 are inside this area. Iron ore deposits are automatically state property.)

NORTHERN TERRITORY—*United Uranium N.L.* at South Alligator River is converting the former *Northern Hercules* mill at Pine Creek and hopes to begin uranium oxide production by January 1959. Discussions with *United Kingdom Atomic Energy Commission* are still proceeding, but it is known that United Uranium has proved sufficient ore to qualify for a long-term contract. Pending finalizing of the arrangements, exploration activity has been confined to proving ore in the known deposits about which the negotiations with AEC are continuing. The company has recently purchased *North Australian Uranium Corporation's* shares in the *Scinto* group of leases which had been held jointly by the two firms.

REPUBLIC OF THE PHILIPPINES—Both Houses of the Philippine Congress have passed the nickel bill which provides incentives for foreign investors in developing the extensive government-owned nickel deposits at Surigao. Main provisions of the bill reportedly exempt a mining company from all taxes until 75 percent of the original capital has been recovered; fix government participation in earnings at a rate not to exceed 25 percent of the net profits or 3.5 percent of the gross income, whichever is higher; allow the company to repatriate up to 80 percent of its foreign capital within five years from start of production. Remittance of earnings and dividends will also be permitted, provided the total remittance and repatriation for any one year does not exceed 50 percent of the total investment.

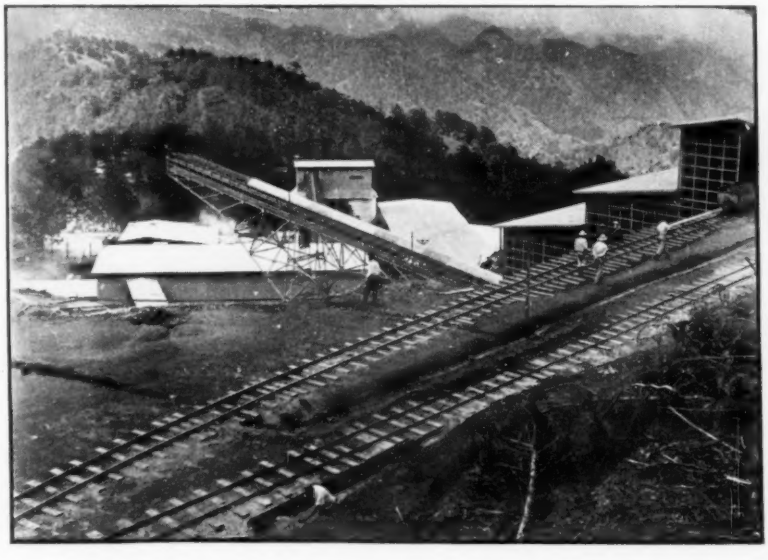
WESTERN AUSTRALIA—Shipments of gypsum from Lake Cowan have commenced and may develop into an important activity. (Lake Cowan is three miles south of Noresman. The port is Esperance, in the Great Australian Bight. *Ravensthorpe Copper Mines N.L.* also ships concentrates from Esperance.) Lake Cowan contains about 2,000,000 tons of seed gypsum of 98 percent purity with a further 900,000 tons averaging 93 percent. The initial shipment has gone to Malaya and it is expected that the quantity shipped will rise to 1,000 tons per week. Malayan cement producers are using the gypsum. A trial shipment is also being sent to Japan. If repeat orders are obtained, a washing plant will be installed at Norseman.

NEW CALEDONIA—*Societe Le Nickel* reportedly not only does not plan to cut production from its facilities at Noumea, but is proceeding with expansion plans. Output in 1958 is expected to total 13,000 tons, increasing to 18,000 tons in 1959, 22,000 in 1960 and between 25,000 and 27,000 tons in 1961. French demand at present is for between 13,000 and 14,000 tons annually. It is expected that the surplus would be marketed in Europe. One goal of the expansion program is to cut production costs, thereby allowing a reduction in selling prices, too.

NEW ZEALAND—A Canadian concern is reported to be applying for a license to mine titanium-bearing ilmenite under a 70-year mining plan at Muriwai Beach near Auckland. It is understood that the cost of this project is nearly $1,000,000.

AFRICA

UNION OF SOUTH AFRICA—*Umgababa Minerals Ltd.* has commissioned its £1,500,000 concentrating plant located about 24 miles south of Durban. Batteries of Humphrey spirals will produce a concentrate of ilmenite, rutile, and zircon, which will be differentially separated by electromagnetic and electrostatic separators. The company has contracted to supply the ilmenite to a titanium paint and



Philex Starts New Copper Mill in Philippines

Philex Mining Company's new 2,000-ton-per-day copper flotation mill at Baguio, Mountain Province, Republic of the Philippines, is pictured above. The new mill is rapidly being brought to capacity operation after first production late in June. Ore is mined from a surface glory hole and dropped down transfer raises to the main adit where it is loaded into four-ton cars and hauled to the mill by Diesel locomotives. Over 1,000,000 tons of ore will be glory holed while the mine is being prepared for block caving. This near-surface ore has proved higher in both copper and gold than the mine average, so concentrates to date have assayed 28 to 33 percent copper and 2.0 ounces gold per ton. As mining gets deeper, concentrate will assay 27 percent copper and 1.0 ounce gold per ton because the primary ore does not contain chalcocite, covellite, and bornite found near the surface. The main line track in the foreground extends one mile to the mine portal. Cars are rotary dumped onto an apron feeder leading to a 30- by 42-inch Kue Ken crusher. The long conveyor in the center extends from crushing plant to a 10,000-ton surface surge pile. Ore is drawn from storage and conveyed to secondary crusher building in left center where ore is washed and fine crushed by a Symons 4-foot Standard cone and two No. 636 Allis-Chalmers Hydroclones. Crushed ore is conveyed to two 750-ton steel fine ore bins. The main mill building houses the grinding and flotation sections, as well as the Diesel-electric power plant. Fine grinding is done in a 10- by 10-foot Marcy ball mill in closed circuit with a 78-inch Wemco classifier and two Krebs cyclones. Sixteen, 66-inch Fagergren roughers and 12 Denver Sub-A cleaners make up the flotation section. A Trayler 75 ball mill in closed circuit with a Krebs cyclone comprises the regrind circuit. Due to the extremely mountainous country, which shows so clearly in the picture, it was necessary to build the concentrate filter plant in the valley one mile away and 900 feet lower than the mill. Concentrate is piped to filter plant. Mine development and mill construction were supervised by Philex general manager, George Scholey. Henry Brimo is president, and Paul Schafer, vice president.

products factory jointly operated by the *African Explosive* and *British Titan* companies. The raw beach sands will be removed from site by rotary excavators feeding mobile "stackers" that, in turn, feed the conveyor system discharging into the plant's surge bins. The sands will be pulped with sea-water for treatment in the spirals, the concentrates from which will be washed by fresh water and then differentially separated. Output capacity of the plant will be 100,000 tons of ilmenite a year; 10,000 tons of zircon; and 7,000 tons of rutile.

KENYA—Using an airborne scintillometer of the latest type, the *United Kingdom Atomic Energy Authority* has initiated a radiometric survey for uranium over 4,000 square miles of the coastal belt.

SWAZILAND — In association with *Guest, Keen and Nettlefords Ltd., Anglo American Corporation of* S.A. has formed the *Swaziland Iron Ore Development Company Ltd.* in which it holds the controlling interest. The company has an exclusive prospecting license over the iron ore deposit at Bomvu Ridge near Mbabane. A geological and metallurgical investigation of the deposit is now being made with a view to development.

FEDERATION OF RHODESIA & NYASALAND—The *Iron Duke Mining Company Ltd.*, which operates a pyrite mine and owns certain other mining rights in Northern Rhodesia, has installed additional plant and equipment to expand pyrite output, for which a ready market exists in Southern Africa. The firm is a part of the *Anglo American* group.

BELGIAN CONGO—Production figures for 1957 have been revealed by *Union Miniere du Haut Katanga*. For the first time, they include production from the *Shinkolobwe* uranium mine. Total ore mined by the company was 10,047,907 metric tons. Of this amount, 311,373 tons were uranium ore treated in the Shinkolobwe concentrator. The remainder, totaling 9,736,534 metric tons, was copper ore from the western mines, plus copper-zinc ore from the underground *Prince Leopold* mine. The *Kamoto* open-pit mine also took an increasing part in this production and *Kolwezi* mine has been reopened after more than three years of idleness. From this ore, 240,280 metric tons of metallic copper were recovered. This is an indicated recovery grade of 2.47 percent copper, very high grade in comparison to *Utah Copper Division* of *Kennecott Copper Corporation* which, although the largest copper producer in the world, in 1957 treated ore averaging 0.825 percent.

UNION OF SOUTH AFRICA—*De Beers Consolidated Mines Ltd.* is now proceeding with productive operations in its *Annex Kleinzee* lease area of 20,000 claims on the Namaqualand coast. Sufficient prospecting work has been advanced to assume that there are at least 500,000 carats in the area at a grade permitting a reasonable profit. The 500,000-ton-per-month reduction and recovery plant of De Beers erected at Kimberley at a cost of £1,500,000 has been officially opened for production. The plant is capable of handling Kimberlite mined by all the group's mines in the area, should this be necessary. Lower recovery costs are expected from the new plant.

SOUTH WEST AFRICA—*South African Minerals Corporation Ltd.* has decided that the best interests of the company require that production of manganese ore should be suspended by August 31 of this year, when all outstanding orders will be fulfilled. The decision follows the recession in world steel production and consequent surpluses of manganese ore supplies. Contracts presently being offered to the corporation provide little or no profit and much risk, according to company officials, and might impair the financial soundness of the corporation. The mine properties are being placed on a caretaking basis which will facilitate the resumption of production on the restoration of more propitious market conditions.

GHANA—*Amalgamated Banket Areas Ltd.* has shown a considerable improvement in its production since its start of underground operations. Previously the firm had been a comparatively low-grade gold producer with operations dependent mostly on open-pit ore. Since going underground, the tonnage as well as the grade has been stepped up appreciably; for example, tonnage and grade milled during the first quarter of 1957 were 174,391 and 3.94 dwt. per ton, respectively, while during the same quarter of 1958 these figures were 184,293 and 4.89 dwt. per ton. The improvement is due to stringent economy measures which have been introduced. A re-examination of blasting methods has brought about a saving of £40,000 in mining costs since March 1957 and a keen eye is kept on power utilization as well as other factors which affect costs.

FEDERATION OF RHODESIA & NYASALAND—*Nchanga Consolidated Copper Mines* at Chingola, Northern Rhodesia has completed extensions to its leach plant which have ended the major part of the £7,000,000 development program started two years ago. Major additional items of equipment were nine filters for concentrate leach, one hydroxide filter, two 50-foot-diameter thickeners, and 24 lead-lined electrolytic cells. Steady progress is being made at the company's C shaft which is being sunk from its original depth of 1,819 feet to a new depth of 2,500 feet. The mine will then be developed on the 2,120-foot level. This new level is expected to be developed with twin haulages, using the high-speed, multi-blast technique to drive them at maximum speed.

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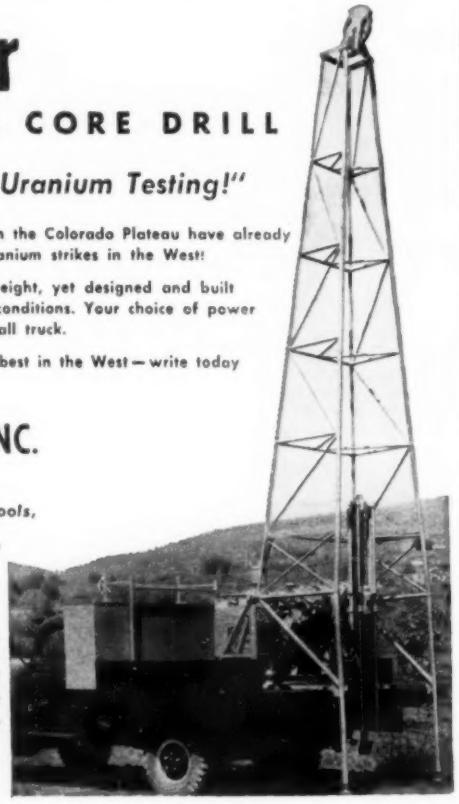

Here's one of the portable, self-contained Acker Teredo Drills already in use on the rough, remote terrain of the Colorado Plateau. A built-in water supply tank permits this rig to operate anywhere!

NORTH AMERICA

BRITISH COLUMBIA—*Silver Mountain Mines Ltd.* of Alberta is driving an exploration tunnel on a 26-claim group near the *Cody Reco* mine. Outcrops also are being stripped.

QUEBEC—*Lake Asbestos of Quebec Ltd.* has gone into production after four years of development. *American Smelting and Refining Company*, parent firm, has spent $35,000,000 in removing overburden, draining Black Lake, diverting the course of Becancour River which feeds it, and building an $11,000,000 mill. The mill is designed to handle 4,000 tons of asbestos ore daily but will take about six months to reach this capacity. Market

conditions will control actual output. Reserves are estimated at about 50,000,000 tons of ore averaging over 7 percent recoverable fiber of various lengths.

SASKATCHEWAN—*Potash Company of America, Ltd.*, wholly owned Canadian subsidiary of *Potash Company of America*, has intersected the ore zone at a depth of 3,330 feet at its property near Saskatoon. The shaft is being completed to a depth of 3,450 feet to allow for storage and working space. It is expected that some production may be forthcoming before the end of 1958.

QUEBEC—*Dominion Steel and Coal Company* and *Algoma Steel Corporation* are competing for the $4,000,000-plus rail contract to be let by *Cartier Railway Company*, subsidiary of *Quebec Cartier Mining Company*, in turn a subsidiary of *U.S. Steel Corporation*. Cartier Railway is to construct a rail line to connect the *Mt. Wright* iron ore area with the Gulf of St. Lawrence at Port Cartier near Shelter Bay. Total cost of the entire mine project is set at between $200,000,000 and $300,000,000. (See MINING WORLD, July 1958, page 75.) The rail equipment contract would supply 115-pound rails for the 200-mile single track railroad.

YUKON TERRITORY—*Yukon Consolidated Gold Corporation* is operating dredges Nos. 4, 6, 8, 9, 10, 11, and 12, this season, together with the hydraulic plant on Paradise Hill. An operation combining hydraulic and mechanical methods (no. 14) has been started on Dominion Benches upstream from Dredge No. 12. During 1958, exploration for gold placer possibilities will be continued in the Klondyke area. Among the probable other projects are these: a helicopter supported exploration program in the Ogilvie Mountains region north of Dawson, and continuation of exploratory work for base metals in New Brunswick under the supervision and in conjunction with *The Consolidated Zinc Corporation of Canada*.

BRITISH COLUMBIA—George Powell of Vancouver, British Columbia, has taken over the *Tamarac* gold property at Ymir and is constructing a 15-ton mill.

ALBERTA—A gold strike has been reported near the Athabasca River, 275 miles northeast of Edmonton. According to the provincial mining recorder's office, 15 to 20 claims more than normal for the region have been staked in an area north of McMurray.

QUEBEC—The World Power Conference will be held in Montreal September 7-11, marking only the second time in its 15-year history that the group has ever met in North America. This is also the first time it has met in Canada. Global developments in mining of uranium and coal will be given careful study. Some 15 papers dealing with different aspects of the mining industry will be presented by delegates from Canada, Russia, Australia, France, West Germany, Great Britain, India, Japan, and Denmark. Among those scheduled to be presented is Russia's Dr. A. E. Probst who will discuss "Economic Problems Related to the Development of the Fuel Industry in the USSR."

ONTARIO—A special committee appointed by the Minister of Mines is investigating mining systems employed in the uranium mines of the Elliot Lake area, particularly in relation to methods of rock support. A number of fatal accidents have occurred in the district uranium mines, and the committee is instructed to recommend practices that would ensure safer operation.

ALASKA—Skagway may be the site of a smelting and mineral reduction plant. Incorporation papers for the new firm in Alaska were obtained by Robert Crowe-Swords of Vancouver, British Columbia, together with two lawyers from Juneau. Their plans include the development and operation of hydroelectric plants, wharves, mills, mineral reduction, smelting, refining, and related activities. Approval from the city of Skagway was received recently by the group to conduct testing operations for the possible construction of facilities off the Skagway Beach.

ONTARIO—*Cyprus Exploration Corporation*, exploration subsidiary of *Cyprus Mines Corporation*, reportedly has closed its Canadian offices and dismissed the entire staff. This same action is underway in the United States as the company moves to get out of the exploration field. Cypress Mines will retain its interest in the copper-zinc property at Lake Aylmer, 50 miles northeast of Sherbrooke, Quebec, where the company has been financing an intensive exploration program. The property is held by *Hastings Mining and Development Company*.

QUEBEC—*National Gypsum Company* has completed its new multi-million dollar

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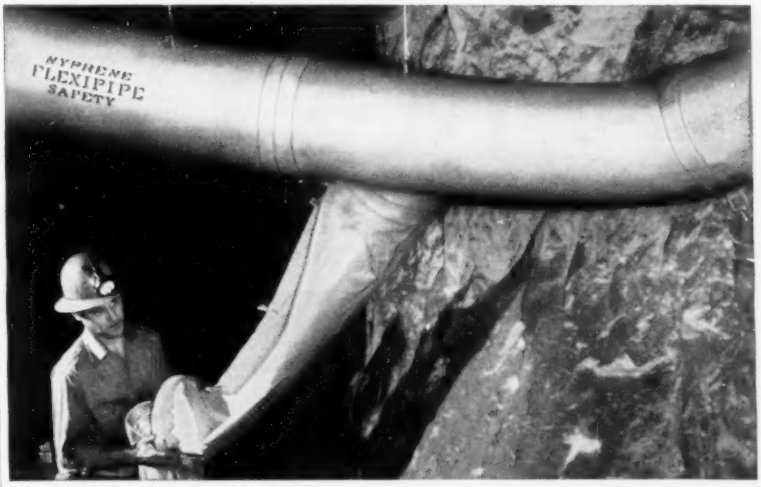

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asbestos mine and mill at Thetford Mines, Quebec, and the operation has gone into production. Daily ore capacity is 3,000 tons, and the mill will produce 50,000 tons of asbestos fibre annually. The parent company operates the new plant, known as *National Asbestos Mines, Ltd.*, through its wholly owned Canadian subsidiary, *National Gypsum Canada, Ltd.* Robert S. Coleman is manager of the asbestos operation.

ONTARIO—*International Nickel Company of Canada* has cut its nickel output at the *Sudbury* mines by an additional 20 percent, or 4,166,000 pounds a month. The cutback brings the company's production to an annual rate of 200,000,000 pounds, compared with 250,000,000 pounds previously. This is also the third reduction for Inco this year, or a total reduction of 110,000,000 pounds. Since copper is contained in the nickel ores mined by the firm, reductions will also be made in copper output by similar percentages. The curtailment is not to affect the new *Thompson* nickel project in Manitoba.

EAST GERMANY—The new nickel smelter and refinery under construction near St. Egidien in the province of Saxonia is now nearing completion. The plant will produce ferro-nickel by the Renn process, using ore from a deposit near Kuhschnappel in the Granulitgeberge. The ore deposit is said to be about 30 feet thick and will be mined by open-pit methods.

FINLAND—*Outokumpu Oy* has acquired mining rights for an iron deposit located in a 100-square-kilometer area near Kuhmo in eastern Finland. The ore is reported to contain 40 percent iron.

NORWAY—A new steel rolling mill is planned at the iron works of *Mo i Rana* in northern Norway. The 250,000,000-crown government project will be submitted to the National Assembly for approval this fall.

SWEDEN—*Tuollavaara Mining Company* in northern Sweden plans to increase its annual ore production from 415,000 to 570,000 tons. It is estimated that 6,000,000 crowns will be needed to finance the expansion.

SPAIN—A new 800-ton-per-day blast furnace was blown in recently at *Altos Hornos de Viscaya's* operations near Sestao, replacing a 300-ton-per-day furnace.

UNITED KINGDOM—*South Crofty Ltd.* has installed a new rod mill at its tin producing operation in Cornwall and a transition from stamps to rod milling is expected to take place during the summer holiday period. The company is presently involved in the problem of securing adequate capital to finance deepening of Cook's Kitchen Shaft at Camborne.

RUSSIA—The problem of increased shipments of Russian tin to Western markets has been brought before the International Tin Council, and it is expected some action will be taken to induce Russia to join the International Tin Agreement. During 1957 Russia shipped an estimated 9,000 long tons of tin to Western markets, but during the first three months of 1958, shipments had increased to 4,000 tons, equal to an annual rate of 16,000 tons. In the meantime, Belgian Congo, Bolivia, Indonesia, Malaya, Nigeria, and Thailand (producers of approximately 90 percent of the Free World's tin supply) have agreed to reduce tin shipments nearly 40 percent, and have contributed an estimated $47,600,000 to a fund used to support tin prices on the London market. No official reports have been released indicating that Russia would want to join the Tin Council.

SPAIN—*Minera de Cantos Blancos* has announced plans to build a 100-ton-per-day flotation plant for copper extraction in the province of Cordoba.

FINLAND—According to recent reports, an iron plant consisting of a foundry, steel mill, and plate mill will be constructed at Otamaki, using Russian plans and material, as a result of the visit of Finland's president, U. Kekkonen, to the Soviet Union. The plant will produce 120,000 tons of rolled plate annually and will cost approximately 18,500,000,000 Finnish marks.

USSR—Extensive deposits of diamonds, larger on an average than those mined in the Belgian Congo, found in the Yakutia area recently strengthen the belief of the Soviet geological fraternity that the whole of the Siberian plateau is diamond bearing. There are vast areas of the Soviet Union, the geologic character of which gives evidence of rich mineral resources, which as yet have been scarcely prospected. This applies particularly to parts of Kazaklstan, Siberia, and the Far East of Russia. In northern Siberia, for example, it is almost certain that discoveries of mineral deposits are being made on a scale at least equal with those being made in similar geological areas in Canada, and it is claimed that one of the main reasons why the sixth Five-Year Plan has been altered is that these vast new resources have been discovered. When and how these new resources will influence the world commodity markets is a matter of conjecture, but Russian exports, notably aluminum, are already upsetting many base mineral producers. In the case of aluminum, Canadian exporters are now offering "loyalty cuts" in order to induce existing clients to buy their products rather than the cheaper priced Russian material.

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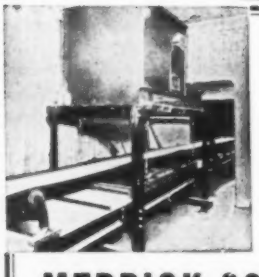

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UNITED KINGDOM—A 100-ton plant for producing stone flux for the ceramic industry is now in operation at Foxdale, Isle of Man. The plant, operated by a subsidiary of *Colin Stewart Ltd.*, utilizes a combination of ordinary flotation and table flotation to treat granite, eliminating mica and producing a feldspar-quartz mixture.

POLAND—The *International Conference on Mine Construction* will be held in Warsaw from September 15 to 25, 1958. Delegations will attend from Austria, Belgium, Czechoslovakia, France, East Germany, West Germany, Poland, Hungary, Great Britain, and the USSR. A total of 72 papers will be read, covering such subjects as: methods of scientific research in mining; methods of exploration and valuation of deposits for mine construction; special conditions limiting development of a deposit; planning structure of underground mines and open-pit mines; principles of reconstruction and modernization of mines; basic trends in mechanization of mines; planning and layout of new mine areas; drainage.

ITALY—The *Montecatini Company* reported satisfactory activity in 1957, despite the reduced activity in certain sections and increased competition. In the mining division, the firm reported 1,312,000 tons of pyrite produced during the year. Sulphur production was still difficult under international competition. Production of bauxite was 205,119 tons, equal to about 78 percent of the nation's output. Production of galena and sphalerite was lower than in the previous year. Some efforts were also made in exploration and research of radioactive materials.

SWITZERLAND—A Swiss group reportedly has been formed, with headquarters in Bern, to prospect and possibly develop the uranium find made in the Swiss Alps. The group also plans to seek other radioactive materials.

UNITED KINGDOM—A new type of nickel has been developed by *Metachemicial Processes Ltd.* of Crawley, England. The new material, called micrograin nickel, is reported to have an unusually fine grain and high purity which resists filing but is still flexible. It is compared in cost to pressing parts from stainless steel, but is believed to be about 14 times as strong as stainless steel.

LATIN AMERICA

ARGENTINA—*Compania Minera San Juan* has opened its new aluminum sulphate plant at Jachal. Capacity of the new installation is 30 tons per day, and the ore, averaging 8.0 percent Al_2O_3, is brought from the company's mines at Valle del Cura, 130 kilometers from Jachal. Until now, the only district producer of aluminum sulphate in the country was Calingasta, also in the province of San Juan, near the Andes. All of the national output is used as flocculant in the waterworks of Buenos Aires.

MEXICO—*Altos Hornos de Mexico* is reported to have purchased the *Perla* iron ore mine from *La Consolidada* steel mills at a cost of $2,000,000. Altos Hornos operates the large steel mill at Monclava, in Coahuila state. The Perla is located about 115 miles away. A railroad is being built from the mine to the mill at an estimated cost of $4,800,000. The new ore supply source is said to be higher in grade than the present source which is *Cerro de Mercado* in Durango state. Altos Hornos is owned 75 percent by *Nacional Financiera*, the government financial agency, and 25 percent by private stockholders.

HAITI—*Consolidated Halliwell Ltd.'s* Haitian subsidiary, *Sedren* S.A., is rushing development of the copper property in the Terre Neuve district. (See MINING WORLD, June 1958, page 83.) Underground crews are expanding development of the 1,300 and 1,500 levels of the *Meme* mine to permit access to stoping areas. Sinking is to start soon on a fourth level. A causeway and dock are being built so that equipment for the 1,500-ton mill can be moved into the site. Drilling has provided water for future milling operations. Additional drilling is continuing to seek more water and extend ore reserves. Original indications showed 5,149,000 tons averaging 0.70 percent copper.

CUBA—*Minera Internacional de Cobre* S.A., headed by Dr. Octavio Hernandez, plans to build a $15,000,000 copper smelter if it obtains the approval of *BANDES*, the *Economic and Social Development Bank*. The plant would have a capacity of 20,000 tons of refined copper per year, but initially would produce 12,000 tons a year. It would also include a sulphuric acid unit and superphosphate fertilizer plant. BANDES is said to be studying the proposal carefully because

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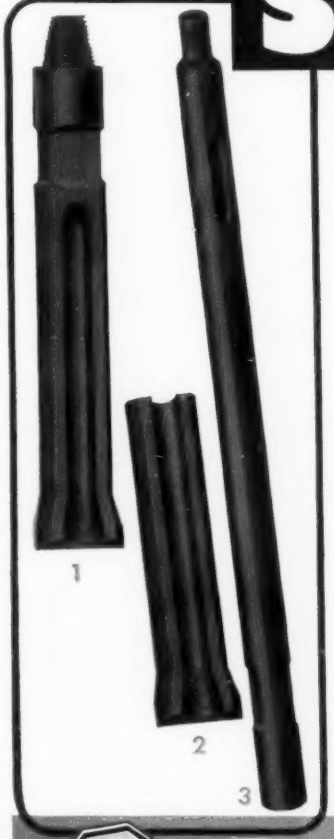

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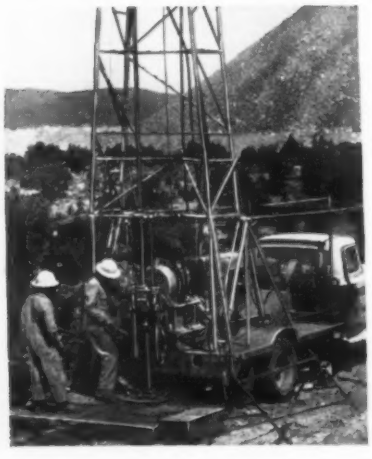

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the planned sulphuric acid plant is not needed at present because of the new sulphuric acid and metal recuperation plant currently being financed by the agency for Dr. Ernesto Romagosa at Santa Lucia, Pinar del Rio Province.

BRITISH GUIANA—*British Guiana Diamond Mining Corporation* is operating a hydraulic dredge in its concession area of about 15 miles starting from the mouth of the Mcamu River, and containing an area of about 1,000 acres. An estimated 2,000,000 cubic yards of gravel is in the river bed alone, and the firm also has 200 feet on either side of the river bank available for development. Average content is estimated at 1.5 carats per yard. The firm is attempting to apply modern mechanization and modern equipment in separating gold and diamonds from the hard-packed gravels. The hydraulic dredge uses water pressure to force gravel up a large tube. The gravel is washed and diamonds and any gold are separated in a small plant. Divers are needed to guide the nozzle and prevent fouling of the lines. Eventually, the company hopes to install a central separating plant as other dredges are brought into the area. The firm is financed by a group of Canadians.

CHILE—Progress at the new *El Salvador* plant of *Anaconda Company's* subsidiary *Andes Copper Mining Company* is being maintained, and production at the rate of 25,000 metric tons is expected by the middle of 1959. A rate of 100,000 tons is expected by the end of 1961. The company is continuing to survey various regions in Chile for other important copper deposits.

BRAZIL—Special loading facilities for iron ore fines are being constructed by *Companhia Vale do Rio Doce* at the docks in Vitoria. Special ore cars are also being ordered for the *Vitoria-Minas Railway* which carries the ore from the mine to the port. Rio Doce exports almost 85 percent of all Brazilian iron ore exports. Last year the firm shipped 120,000 metric tons of these fines to Poland and Czechoslovakia; both countries are experimenting with special sintering facilities.

PERU—*Wells Overseas Ltd.* of Toronto, Canada, has received the contract for construction work and development of the mine at the *Acari* iron deposits south of Lima. An airport and highway are being constructed by Wells, and *Frederick Snare Corporation* of New York is proceeding with building of a new pier at the port of San Juan. First ore shipments are expected in the middle of 1959, following completion of the San Juan pier, at an initial rate of 1,000,000 tons per annum. The property is owned by *Panamerican Commodities* S.A., but operated by a subsidiary, *Compania Explotadora de Hierro Acarai*, S.A. Some 10,000,000 tons of proven reserves have been blocked out, with exploration still continuing.

MEXICO—The leading miners union has presented a petition to the newly created *Economic and Social Planning Council* in Mexico City calling for unification of all governmental activities pertaining to the mining industry. Similar demands have been made by other segments of the mining industry. The proposals all point out that at present various mining matters are handled by the *Ministry of National Economy*, the *Non-Renewable Resources Commission*, the *Mining Promotion Commission*, the *Nuclear Energy Commission*, and others. Among suggestions made are that the new government department make a thorough survey of all Mexican mineral resources, set up incentives to bring private Mexican capital into mining operations, carry out research for development of new industrial uses for Mexican minerals, and take steps to encourage establishment of refining and processing industry within the country.

MEXICO—*Cia. Industrial y Minera de Occidente* S.A., in the city of Mazatlan, has started operation of a refinery for gold and silver bullion. The gold-silver bars will come from the *San Luis* mine located at Tavoltica, state of Durango.

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Capitol Concentrates

Continued from page 9

recommending certain subsidy payments designed to keep income at the stabilization levels.

So the Administration has run the gamut from purchase programs, through one for increased tariffs, and has ended up with a sort of "Brannan" subsidy plan for minerals to last for five years. All of these proposals have been dubbed by the Administration as "long-range minerals programs."

• Gold Miners Seek Claims Court Action

Representative Rogers of Colorado has introduced a Bill, H. R. 13253, to give the United States Court of Claims jurisdiction over claims arising from World War II WPB order L 208. This Bill, when enacted into law, would nullify the recent Supreme Court ruling that the government had not taken gold mines during the war.

The Bill would give to the Court, "Jurisdiction to hear, determine, and render judgment, as a matter of equity and justice, notwithstanding any statute of limitations, laches, or lapse of time, and without permission on the part of the Government or its representatives, to interpose any kind of a defense, on the claim of any owner or operator of a gold mine or gold placer operation for losses incurred because of the closing or curtailment or prevention of operations of such mine or placer operation as a result of the restrictions imposed by War Production Board Limitation Order L-208 during the effective life thereof: Provided, That actions on such claims shall be brought within one year from the date this Act becomes effective.

• Lead-Zinc Export Limits Sought

Some leaders in the domestic lead-zinc industry are reported to be behind the proposal of the U. S. State Department to seek agreement by foreign producing countries for an export limitation on their own mines.

The proposal is not regarded highly by many in the domestic industry, if for no other reason than fear of anti-trust prosecution of the United States companies. Neither is the proposal regarded as an alternative to higher tariffs or quotas on imports.

Industry sources do point out, however, that there's nothing to stop the State Department from acting right now—or in the past—on its own motion in such matters. In fact, it would be a refreshing opportunity for the department to prove its alleged concern about the plight of Domestic miners—regardless of the outcome of the discussions.

COMING CONVENTIONS

September 15 to 25. INTERNATIONAL CONFERENCE ON MINE CONSTRUCTION, Warsaw, Poland.

September 17, 18, and 19. The ROCKY MOUNTAIN MINERALS CONFERENCE, AIME, Newhouse Hotel, Salt Lake City, Utah.

September 22 through 26. American Mining Congress, MACHINERY EXPOSITION AND CONVENTION, Brooks Hall, San Francisco, California.

October 2, 3, 4. Eighth Annual DRILLING AND BLASTING SYMPOSIUM, cosponsored by the University of Minnesota, Colorado School of Mines, and Pennsylvania State University. To be held at University of Minnesota, Minneapolis, Minnesota.

October 20 through 23. National Safety Council MINE SAFETY CONGRESS, Congress Hotel, Chicago, Illinois.

October 14 through 16. Seminar on underground pressures and mine support. Sponsored by the German Academy of Science and the University of Freiburg, Leipzig, Germany.

October 20 to 23. The Seventh NATIONAL CLAY CONFERENCE, National Museum in the Natural History Building of the Smithsonian Institute, Washington, D. C.

October 23, 24, and 25. Society of Mining Engineers, AIME, MID-AMERICA MINERALS CONFERENCE, Chase-Park and Plaza Hotels, St. Louis, Missouri.

October 30, 31 and November 1. Annual convention of the NEW MEXICO MINING ASSOCIATION, Carlsbad, New Mexico.

November 6, 7, 8. Annual Meeting GEOLOGICAL SOCIETY OF AMERICA, St. Louis, Missouri.

U.S.A. Metal & Mineral Prices

METALS

July 21, 1958

COPPER: **Electrolytic.** Delivered F.o.b. cars, Valley basis ..... 26.50¢
Lake. Delivered, destinations, USA ..... 26.50¢
Foreign Copper, Valley basis ..... 26.50¢
Custom ..... 26.50¢
LEAD: **Common Grade.** New York ..... 11.00¢
Tri-State Concentrate, 80% lead $127.32
ZINC: **Prime Western:** F.o.b. E. St. Louis ..... 10.00¢
Prime Western: Delivered, New York ..... 10.50¢
Tri-State Concentrate, 60% zinc, per ton $56.00
ALUMINUM: **Primary 30 Pound Ingots (99% plus).** ..... 26.10¢
ANTIMONY: **Lone Star Brand. F.o.b. Laredo, in bulk** ..... 29.50¢
BISMUTH: (In ton lots) price per pound $2.25
CADMIUM: **Sticks and bars.** 1 to 5 ton lots (Price per pound) $1.70
COBALT: **97.99%,** keg of 550 pounds (Price per pound) $2.00
COLUMBIUM: **Powder** ..... Nom., per pound $120.00
GERMANIUM: **Germanium:** dioxide, high purity, gram .. 24.00¢-30.00¢
LITHIUM: **98%** (per pound) ..... $11.00-$14.00
MAGNESIUM: **Ingots (98.8%)** F.o.b. Velasco, Texas, per pound 36.00¢
MERCURY: **Flasks.** Small lots, New York ..... $228.00-$231.00
NICKEL: **"F" Ingots (5 pounds).** F.o.b. Port Colbourne, Ontario 75.50¢
PLUTONIUM: To July 1, 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram $30.00
SELENIUM: **99.5%,** per pound $7.50
THORIUM: per kilogram $43.00
TIN: **Grade A Brands.** New York (per pound) Prompt delivery .. 94.75¢
TITANIUM: **99.3%** + Grade "A" Sponge (Price per pound) $1.65-$2.05
URANIUM: **Nominal,** per kilogram $40.00
U-235: **Nominal,** per pound $7,725
GOLD: **United States Treasury Price** ..... $35.00 per ounce
SILVER: **Newly mined domestic.** U.S. Treasury price per ounce 90.5¢
Foreign Handy Harmon ..... 88⅜¢
PLATINUM: Per Ounce ..... $67.00-$70.00
ZIRCONIUM: **Sponge, Per Pound,** Reactor Grade $7.50

ORES AND CONCENTRATES

BERYLLIUM ORE: **10 to 12% BeO.** F.o.b. mine, Colorado $46.00 per unit Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $48.00.

CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons
African (Rhodesian). 48% CrO_3. 3 to 1 Ratio ..... $46.00-$47.00
African (Transvaal). 48% Cr_2O_3. No ratio ..... $36.00-$37.00
Turkish, 48% Cr_2O_3. 3 to 1 chrome-iron ratio .... Nominal $53.00
U.S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade ore and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3. Buying suspended, quota filled.

COLUMBIUM-TANTALUM ORE: At United States small lot beryl purchase depots, $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus. (Government stopped buying temporarily May 12, 1957) ..... Per Pound Pentoxide ..... $1.15-$1.35

IRON ORE: **Lake Superior. Per gross ton Lower Lake Ports**
Mesabi, Non Bessemer, 51.5% Fe $11.45
Mesabi, Bessemer, 51.5% Fe $11.60
Old Range Non Bessemer $11.70
Old Range Bessemer $11.85
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit.. 26.00¢

MANGANESE ORE: **Metallurgical grade.** 48 to 50% Mn. Long ton unit ..... $1.20-$1.25
Metallurgical grade. 46 to 48% Mn. Long ton unit .... $1.15-$1.20
Metallurgical grade. 44 to 46% Mn. Long ton unit .... $1.10-$1.15
Domestic U.S. Government purchasing depots: Butte, Mont.; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Mont.; base $6.43 per long ton of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40%. Base (48%) $2.30 per unit with premiums and penalties.

MOLYBDENITE CONCENTRATE: **90% MoS_2 F.o.b.** Climax, Colorado. Per pound Mo, plus container cost $1.18

TUNGSTEN CONCENTRATE: **Domestic.** 60% WO_3 Per short ton unit $12.00
Foreign. 65% WO_3 Per short ton unit (Scheelite) .. Nominal $12.00
Foreign: South American, Spanish, Portuguese .... Nominal $11.00

URANIUM ORE: F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is $1.50 per pound of U_3O_8 in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.

NON-METALLIC MINERALS

BENTONITE: **Minus-200-mesh.** F.o.b. Wyoming. Per ton, carload lots $12.50
Oil Well grade. Packed in 100 pound paper bags $14.00
BORON: Technical grade .... F.o.b. Boron, California. Per ton $47.50
FLUORSPAR: **Metallurgical grade.** 72.5 % effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines .... $38.00-$40.00
Mexican. 70% F.o.b. border ..... $26.00-$27.00
Acid Grade. 97% CaF_2, Bulk, F.o.b. mine ..... $48.00-$52.00
Government buying F.o.b. producer's shipping point: 60% Illinois-Kentucky, $34.50 per ton, others $28.50; 70% Ill.-Ken. $38.50, others $32.50.
PERLITE: **Crude:** F.o.b. mine per short ton ..... $3.00 to $5.00
Plaster grades. Crushed and sized. F.o.b. plants .... $7.00 to $9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas $25.00
Export ..... $24.00-$25.00

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COPPER:	**Electrolytic spot**	£198	15s 0d	24.86¢
LEAD:	**Refined 99%**	£ 71	10s 0d	8.94¢
ZINC:	**Virgin, 98%**	£ 64	5s 0d	8.03¢
ALUMINUM:	**Ingot, 95.5%**	$180	0s 0d	22.50¢
ANTIMONY:	**Regulus, 99.6%**	£197	10s 0d	24.69¢
TIN:	**Standard, 99.75%** ..	£770	10s 0d	91.31¢
TUNGSTEN:	**Long ton unit**	62s		$8.68

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Ambrosia Lake

Continued from page 33

It's not all bad. Ambrosia's wet mines do have very important advantages. The ore has a high dollar value. The mines are relatively shallow for low-head pumping, easy hoisting, and not too difficult ventilation. Rock and water are cool. There is a surplus of labor. Drilling is fast. Powder consumption is low. A good raise miner can drive 22 to 25 feet of development raise per shift, under contract, starting from the sill. As few as five holes will break a round.

How About A Dream Mine?

Right along with equipment trials, drainage rate studies, ground support plans, tonnage and grade evaluation, and dilution control there has been and will be a lot of dream mining.

A typical dream mine would use hydraulic jets to stope the ore with the jet stream instantly directed and positioned by a gamma device continuously analyzing the cuttings. The height, bottom, and lateral traverse of any cutting jet would be set so that cutting action would be shifted away from area where ore changed to waste as indicated by analyzing the cuttings flowing from the face.

The ore, and there will of course be separate waste cuttings, will be flumed to giant underground agitation tanks for storage. Pulp from these tanks, as needed, will be drawn off, cycloned to desired density, and pumped to the surface. Waste would be directed to surface storage ponds and the ore stored in agitators. All ore of course would be pipe lined directly into the mill's grinding-classifier circuit. The correct density for long distance pumping will be established as the ore pulp leaves the surface agitator.

Don't underrate Ambrosia, don't discount Ambrosia, and don't think for a minute that Ambrosia won't be one of the world's great mining districts. The most important thing, and without it no camp or mine can be great, is ore. And Ambrosia has ore. Tremendous tonnages, good thicknesses, and high values. Think of it—you iron miners, or you porphyry copper, or None Such shale miners—Ambrosia ore has a value of about $25.00 a ton in the ground. Even if mining costs are half that, there's good profit. And you can square set a lot of stopes if you have to and still make money on $25.00 ore.

There's no question about it. Ambrosia "wet ore" will be mined.

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1— 8T WEST. 250 V. 28-24" Ga.
4— 6T WEST. 250 V. 30-24" Ga.
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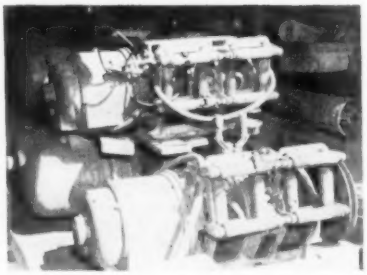

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1—40 HP Vulcan #22C
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1—50 HP Vulcan
1—50 HP Box
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8—Gardner-Denver Model HK
2—Joy "Turnbinair" Model F-113
1—Sullivan Model L-111
2—Ingersoll-Rand Model 10HR
1—Sullivan Model HA 3
3—Ingersoll-Rand Model H4

ELECTRIC TUGGERS AND SLUSHERS

4—5 HP Sullivan, 2 drum slushers
1—5 HP Sullivan tugger
2—7½ HP Sullivan tuggers
1—10 HP Sullivan 3 drum slusher
2—15 HP Ingersoll-Rand size 15NN-IG, 2 drum slushers
2—20 HP Ingersoll-Rand size 20NM2C, 2 drum slushers
1—50 HP Sullivan Model CF-211 double drum slusher
1—10 HP Ingersoll-Rand 3 drum, model 10MNM-2G

AIR SLUSHERS

4—Ingersoll-Rand Model A5NNOH
4—Joy Model FF211
1—Ingersol-Rand Model HNN-1J

LOADERS

17—Eimco 12B, 18" ga.
8—Eimco 21, 18" & 24" ga.
3—Gardner-Denver Model 9, 18" ga.
1—Joy HL3, 18" ga.
1—Joy HL20, 24" ga.

APRON FEEDERS

1—24" x 20' Link-Belt
1—42" x 18' Stephens-Adamson

DRILLING EQUIPMENT

14—Ingersoll-Rand Model R48 Stopers
20—Ingersoll-Rand Model JR38A Jack Drills
7—Gardner-Denver Model FL48-4 Air Leg Drills
3—Thor Model 390 Air Leg Drills
6—Atlas Copco Model BBL22 Jack Drills
6—Ingersoll-Rand Model DA35 Drifters

GYRATORY CRUSHERS

1—2' Symons Cone
1—12" Traylor Type T
1—2' 4" Traylor Type TY
1—3' Traylor Type TY

PUMPS—SAND

3—1" Denver
1—1½" Kimball-Krogh
1—1½" Vacseal
1—2" Denver
2—2" A.S.H. Hydroseal
1—2" Vacseal
4—2" Willey
1—3" A.S.H. Hydroseal
2—3" Willey
2—4" A.S.H. Hydroseal
1—4" Willey
1—6" Amsco

SCREENS

1—3' x 6' Symons Single Deck
1—3' x 6' Robins Gyrex
1—4' x 10' Allis-Chalmers Double Deck

TANKS

4—8' x 11'6" Acid Storage Tanks
1—25,000-gal. Steel Tank

BALL AND ROD MILLS

1—4' x 4' Marcy Ball Mill
1—6' x 4' Hardinge Conical Ball Mill
1—6' x 6' Allis-Chalmers Ball Mill
1—7' x 5' Allis-Chalmers Ball Mill
1—8' x 22" Hardinge Conical Ball Mill
1—3' x 8' Morse New Rod Mill
1—4' x 10' Hardinge Rod Mill
2—5' x 10' Traylor Rod Mills

JAW CRUSHERS

6—2¼" x 3½" New Morse Lab Crushers
6—4" x 6" New Morse Lab Crushers
1—6½" x 7" Hendy Jaw Crusher
1—8" x 15" Wheeling Jaw Crusher
1—9" x 16" Day Jaw Crusher
1—9" x 16" Universal Jaw Crusher
1—10" x 16" Universal Jaw Crusher
1—12" x 24" Universal Jaw Crusher
1—9" x 36" Cedar Rapids Jaw Crusher
1—42" x 48" Traylor Jaw Crusher

CONCENTRATING TABLES

10—Deister Diagonal Deck Right Hand
10—Deister Diagonal Deck Left Hand
5—Deister Overstrom Diagonal Deck Left Hand

LOCOMOTIVES

6—1½ Ton Mancha "Trammers"
1—1½ Ton General Electric Battery Locomotive
3—3½-4 Ton Mancha "Titan A" Battery Locomotives
1—4 Ton Westinghouse Battery Locomotive
1—4 Ton General Electric Trolley Locomotive
1—6 Ton Goodman Trolley Locomotive
1—6 Ton Jeffrey Trolley Locomotive
2—6 Ton General Electric Battery Locomotives
2—7 Ton General Electric Battery Locomotives
1—7 Ton Jeffrey Trolley Locomotive
1—7 Ton Atlas Battery Locomotive
2—8 Ton Goodman Battery Locomotives
2—8 Ton General Electric Battery Locomotives
3—8 Ton Ironton Battery Locomotives
1—9 Ton Whitcomb Battery Locomotive
4—10 Ton Atlas Battery Locomotives
2—10 Ton Jeffrey Trolley Locomotives
1—13 Ton Jeffrey Trolley Locomotive
1—13 Ton Goodman Trolley Locomotive
1—15 Ton Jeffrey Trolley Locomotive

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Hardinge Mills	4'-6" x 9', 5' x 6', 7' x 6', 7' x 7' x 48"
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Rod Mills	3' x 6', 4' x 8', 5' x 10', 6'-6" x 14'-0", 9' x 16' Marcy & 8' x 12'
Tube Mills	5' x 22', 6' x 22', 6'-6" x 21', 7' x 18'

FILTERS - SEPARATORS CLASSIFIERS

Oliver Drum	3' x 4', 8' x 10', 11'-6" x 16'
American	12'-6" 9 Disc
Dorr Rake Classifier	4' x 20', 8' x 38', 12' x 31'
Akins Spiral	60" x 23'-6", 78" x 36'-6"
Wemco No. 3	HMS Mobile Mill

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Dryers	3' x 20', 4' x 20', 6' x 28', 6' x 72'
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In first reply, please include information regarding age, experience, compensation and education. All replies confidential. Reply to Box C-1, Mining World, 500 Howard Street, San Francisco 5, California.

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Please send full details by first letter, including location, size of deposit, work done, assays, maps and reports if available, and terms of lease or sale to Box W-2, Mining World, 500 Howard Street, San Francisco 5, California.

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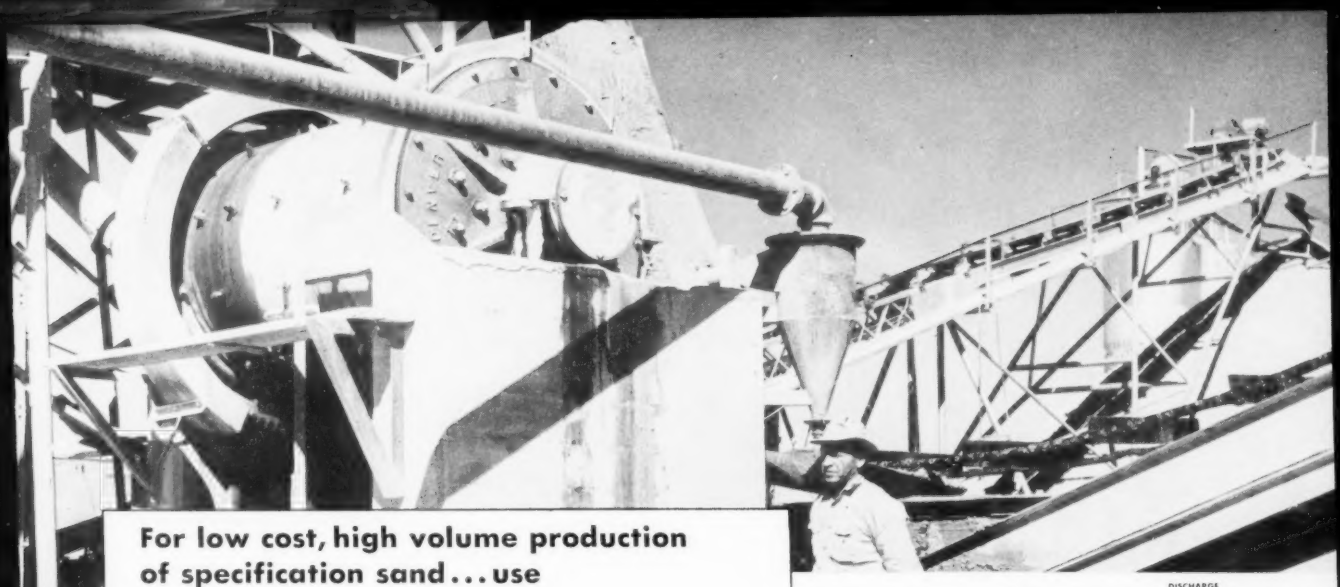

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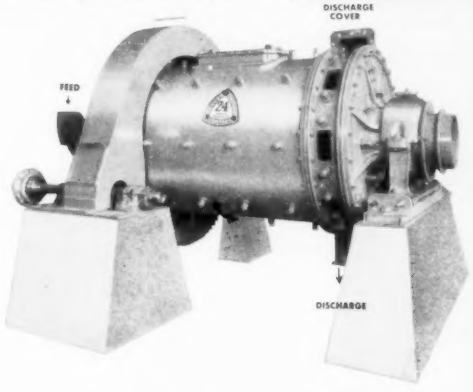
Write for "Production of Specification Sand by Rod Mills"—a bulletin of technical information for operators who have sub-specification sand deposits.



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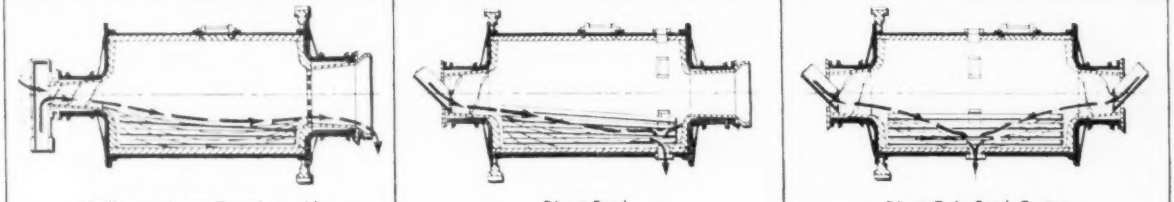

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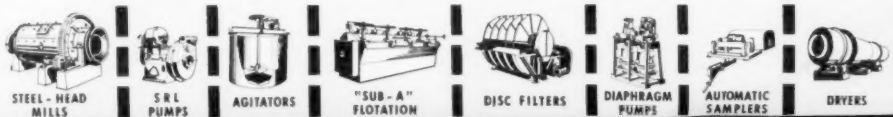

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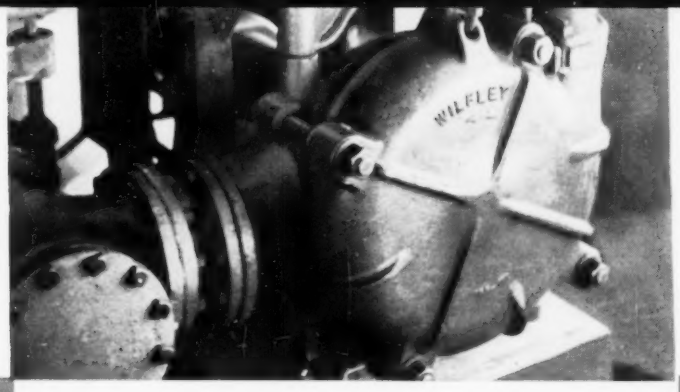

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